

# **Welders and Welders Qualification Tests**

## **Amended Rules and Guidance**

Rules for the Survey and Construction of Steel Ships Part M

Guidance for the Survey and Construction of Steel Ships Part M

## **Reason for Amendment**

Requirements related to welders and welders qualification tests are specified in IACS Unified Requirements (UR) W32 and this UR has already been incorporated into the Rules for the Survey and Construction of Steel Ships.

IACS, however, reviewed a part of this UR, and amended requirements related to the method for maintaining welder qualifications. These amendments were adopted as UR W32 (Rev.1) in September 2020.

Accordingly, relevant requirements were amended in accordance with UR W32 (Rev.1).

## **Outline of Amendment**

Amended the requirements related to the methods for maintaining welder qualifications.

“Rules for the survey and construction of steel ships” has been partly amended as follows:

## **Part M      Welding**

### **Chapter 5    WELDERS AND WELDERS QUALIFICATION TESTS**

#### **5.1      General**

##### **5.1.1      Welders**

Sub-paragraph -7 has been amended as follows.

**7** Notwithstanding the requirements in this chapter, welders qualified in accordance with national or international welder qualification standards may also engage in the welding work at the discretion of the Society provided that the qualification testing, range of qualification and revalidation requirements, etc. are considered equivalent to this chapter. Alternative national or international welder qualification standards, however, are to be applied in full and the cross-mixing of requirements from standards is not permitted.

##### **5.1.3      Welder Qualification Certificates\***

Sub-paragraph -1(7) has been added as follows.

**1** Qualification certificates are to be issued to the applicant by the Society for welders who have passed qualification tests. Qualification certificates are to include the following items:

- (1) Essential variables (welding process, product, type of welded joint, base metal, welding consumable, base metal thickness, outside diameter, welding positions and detail of welded joint.)
- (2) Range of qualification for (1) above.
- (3) Period of validity for the qualification certificate.
- (4) Name, date of birth and photograph of the welder.
- (5) Name of the applicant.
- (6) Welder’s ID.
- (7) Renewal methods of qualification in accordance with 5.1.6.

Paragraph 5.1.4 has been amended as follows.

##### **5.1.4      Period of Validity for Qualification Certificates\***

A qualification certificate is to be valid from the date on which the welder passed the qualification test to a date not exceeding ~~three years from the said date~~ the period corresponding to the renewal methods selected in accordance with 5.1.6. ~~However, in cases where a welder passes a qualification test (renewal) within six months before the expiry date of the existing certificate, the new period of validity will be three years from the expiry date of the existing certificate.~~

Paragraph 5.1.6 has been amended as follows.

##### **5.1.6      ~~Continuation~~ Renewal of Qualification Certificates\***

**1** ~~Welders qualified by the Society are, for continuation of their qualification, to have the qualification tests (renewal) prior to the due date. In cases where welder has passed the tests~~ The

period of validity for a qualification certificate is to be renewed in accordance with ~~the one of the following (1) and to (23)~~, ~~a new qualification certificate with the validity of three years from the expiry date of the existing certificate will be issued methods.~~

- (1) The method in cases where the welder welds a test assembly covered in the qualification test (renewal) in accordance with 5.3 (however, excluding the requirements for ultrasonic testing in 5.3.5-7, 5.3.6-5 and 5.3.7-2) within six months before the expiry date of the existing certificate, and satisfies ~~the~~ either requirement (a) or (b) as well as (c) below, the period of validity for the renewed qualification certificate is to be until three years from the day after the expiry date of the existing certificate.
  - (a) The welder passes the qualification test (renewal) or retest ~~within six months~~ before the expiry date of the existing certificate.
  - (b) The welder passes the retest for qualification test (renewal) ~~within six months~~ after the expiry date of the existing certificate.
  - ~~(2c)~~ In cases where the verification of the validity of qualification certificate specified in 5.1.5 is carried out, and the results of said verification are deemed satisfactory by the Surveyor.
- (2) The method in cases where the welder welds a test assembly covered in the qualification test (renewal) in accordance with 5.3 within six months before the expiry date of the existing certificate, and satisfies either requirement (b) or (c) as well as (a) and (d) below, the period of validity for the renewed qualification certificate is to be until two years from the day after the expiry date of the existing certificate.
  - (a) Two welds made to reproduce the initial test conditions except for the thickness are to be tested by one of the radiographic tests, ultrasonic tests, bend tests, fracture tests, notch tensile tests or macro-structure inspections and the results of said verification are deemed satisfactory by the Surveyor. In such a cases, the test results are to be recorded.
  - (b) The welder passes the qualification test (renewal) or retest before the expiry date of the existing certificate.
  - (c) The welder passes the retest for qualification test (renewal) after the expiry date of the existing certificate.
  - (d) In cases where the verification of the validity of qualification certificate specified in 5.1.5 is carried out, and the results of said verification are deemed satisfactory by the Surveyor.
- (3) The method in cases where the results of the requirements (a) to (d) are verified and are deemed satisfactory by the Surveyor, the period of validity for the renewed qualification certificate is to be until the date of the next verification from the day after the completion of verification. The frequency of verification is to be no longer than three years and is to be agreed upon by the Society in advance.
  - (a) The welder is working for the same shipyard or manufacturer that is responsible for production weld quality as indicated on his or her qualification certificate.
  - (b) The welder quality management system of the shipyard or manufacturer including the following items at a minimum is verified by the Society in advance.
    - i) A designated person responsible for the coordination of the welder quality management system.
    - ii) List of welders and welding supervisors in shipyard or manufacturer.
    - iii) List of subcontracted welders (if applicable).
    - iv) Qualification certificates of welders and a description of the associated management system.
    - v) Training requirements for the welder qualification programme.
    - vi) Identification system for welders and welding procedure and related specifications used on welds.

vii) The criteria permitting the maintenance of welder qualification without retesting (e.g. repair rate).

viii) Procedure describing the system in place to monitor each welder performance based on results of welds examination records.

(c) The shipyard or manufacturer is to document at least once a year that the welder has produced acceptable welds in accordance with construction quality standards and the welder qualification certificate by the system. Which documents are required and how to document the evidences are to be verified by the Society in advance.

(d) The validity of qualification certificate is verified in accordance with 5.1.5.

**2** Notwithstanding ~~-1(1)~~ above, in cases where the welder welds a test assembly covered on the qualification test (renewal) prior to six months before the expiry date of the existing certificate, passes the qualification test (renewal), and fulfills the requirement ~~-1(2)(c)~~ above, the new qualification certificate is to be valid from the date on which the welder passed the qualification test to a date not exceeding three years from the said date.

**3** In the case of continuation of a qualification, the applicant to which the welder taking the qualification tests belongs to is to submit a completed welder qualification tests application (**Form WE(E)**) along with a photograph of the welder and the existing qualification certificate (copy) to the Society (relevant branch office or service site).

**4** A qualification test (renewal) is, in principle, to be carried out under test conditions in accordance with the essential variables of the qualification test (initial) by each the qualification applying for continuation.

~~**5** A qualification test (renewal) is to comply with the requirements specified in 5.3.~~

**5** In cases where the Society approves the application of alternative national or international welder qualification standards in accordance with 5.1.1-7, the renewal of qualification is to be in accordance with this paragraph.

## 5.2 Qualifications

### 5.2.1 Kind of Qualification\*

Table M5.5 has been amended as follows.

Table M5.5 Essential Variables of Base Metal

Base metal used for test assembly	Symbol	Classification of base metal		Base metal applicable to actual welding work
		Plate	Tube	
Carbon steel	<i>CS</i>	<ul style="list-style-type: none"> <li>• Rolled steels for hulls</li> <li>• Rolled steel plates for boilers</li> <li>• Rolled steel plates for pressure vessels</li> <li>• Rolled steels for low temperature service (except <i>KL2N30</i>, <i>KL3N32</i>, <i>KL5N43</i>, <i>KL9N53</i> and <i>KL9N60</i>)</li> <li>• Rolled steel bars for machine structures</li> <li>• High strength <del>quenched and tempered</del> rolled steels <del>plates</del> for <u>offshore</u> structures</li> <li>• Steel castings</li> <li>• Steel castings for low temperature service (except <i>KLC2</i> and <i>KLC3</i>)</li> <li>• Steel forgings</li> <li>• Steel forgings for low temperature service (except <i>KLF3</i> and <i>KLF9</i>)</li> </ul>	<ul style="list-style-type: none"> <li>• Steel tubes for boilers and heat exchangers</li> <li>• Steel pipes for pressure piping</li> <li>• Headers</li> <li>• Steel pipes for low temperature service (except <i>KLP2</i>, <i>KLP3</i> and <i>KLP9</i>)</li> </ul>	<i>CS</i>
Stainless steel	<i>SU</i>	<ul style="list-style-type: none"> <li>• Rolled stainless steels</li> <li>• Stainless steel castings</li> <li>• Stainless steel forgings</li> <li>• Stainless steel propeller castings</li> </ul>	<ul style="list-style-type: none"> <li>• Stainless steel pipes</li> </ul>	<i>SU</i>
Aluminium alloy	<i>AL</i>	<ul style="list-style-type: none"> <li>• Aluminium alloy plates and extruded shapes</li> </ul>	<ul style="list-style-type: none"> <li>• Aluminium alloy pipes and tubes</li> </ul>	<i>AL</i>
Nickel steel	<i>NI</i>	<ul style="list-style-type: none"> <li>• Rolled steels for low temperature service (<i>KL2N30</i>, <i>KL3N32</i>, <i>KL5N43</i>, <i>KL9N53</i> and <i>KL9N60</i>)</li> <li>• Steel castings for low temperature service (<i>KLC2</i> and <i>KLC3</i>)</li> <li>• Steel forgings for low temperature service (<i>KLF3</i> and <i>KLF9</i>)</li> </ul>	<ul style="list-style-type: none"> <li>• Steel pipes for low temperature service (<i>KLP2</i>, <i>KLP3</i> and <i>KLP9</i>)</li> </ul>	<i>NI</i>
Other metal	<i>ET</i>	• Plates and tubes not listed above		<i>ET</i>

### 5.3 Qualification Tests

#### 5.3.5 Test Procedures

Table M5.15 has been amended as follows.

Table M5.15 Conditions for Bend Tests

Kind of base metal used for test assembly		Radius of plunger ( <del><math>t</math>: Base metal thickness of test specimen assembly</del> )
Carbon steel	KE47	$\frac{5}{2}t$
	KA420, KD420, KE420, KF420, KA460, KD460, KE460, KF460, KA500, KD500, KE500, KF500	$\frac{5}{2}t$
	KA550, KD550, KE550, KF550, KA620, KD620, KE620, KF620, KA690, KD690, KE690, KF690	$3.0t$
	Other than the above <sup>(1)</sup>	$2.0t$
	Stainless steel <sup>(1)</sup>	$2.0t$
Aluminium alloy		$(\frac{100 \times t}{A} - t) \times 0.5$
Nickel steel	9% Ni steel	$\frac{10}{3}t$
	Except above <sup>(1)</sup>	$2.0t$

Note:

- (1) The radius of the plunger is to be calculated from the following formula, where the elongation  $A$  of the base metal is less than 20%

$$(\frac{100 \times t}{A} - t) \times 0.5$$

$A$ : Minimum elongation (%) specified in **Part K**.

Sub-paragraph -3 has been amended as follows.

### 3 Fracture tests

#### (1) For butt welding

- In the case of plate test assemblies, test specimens are to be the whole of test assembly, excluding the edges, in length and are to be tested in accordance with *ISO 9017:2017*.
- In the case of tube test assemblies, test specimens are to be the whole of test assembly specified in **Table M5.5** and are to be selected in accordance with the requirements specified in **Fig. M5.6**. The test method is to be in accordance with *ISO 9017:2017*.
- The widths of fracture test specimens for plates and tubes are to comply with **Table M5.16**.

- (2) For fillet welding
  - (a) In the case of plate test assemblies, test specimens are to comply with the requirements specified in **Fig. M5.4** and be tested in accordance with *ISO 9017:2017*.
  - (b) In the case of tube test assemblies, test specimens are to be the full test specimen specified in **Fig M 5.5** and are to be divided into at least four specimens. The test method is to be in accordance with *ISO 9017:2017*.
  - (c) The widths of fracture test specimens for plates and tubes are to comply with **Table M5.16**.

Sub-paragraph -7 has been added as follows.

#### **7     Ultrasonic testing**

The test is to be carried out on the entire weld of the test assemblies. In the case of plate test assemblies, however, the edges of test assemblies is excluded. Tests are to be carried out in accordance with *ISO 17460:2018*. However, this requirement only applied where the renewal method in **5.1.6-1(2)** is selected.

#### **5.3.6       Acceptance Criteria**

Sub-paragraph -1 has been amended as follows.

##### **1     Visual inspections**

Imperfections detected are to be assessed in accordance with quality level *B* of *ISO 5817:2014*, except in cases where level *C* applies such as for excess weld metal, excess penetration, excessive convexity and excessive throat thickness.

Sub-paragraph -3 has been amended as follows.

##### **3     Fracture tests, notch tensile tests and radiographic tests**

Imperfections which detected are to be assessed in accordance with quality level *B* of *ISO 5817:2014*.

Sub-paragraph -5 has been added as follows.

#### **5     Ultrasonic testing**

Imperfections which detected are to be assessed in accordance with quality level *B* of *ISO 11666:2018*. However, this requirement only applies in cases where the renewal method in **5.1.6-1(2)** is selected.

#### **5.3.7       Retests**

Sub-paragraph -2 has been amended as follows.

**2     Welders who fail to meet the requirements for all parts of visual inspections, bend tests, fracture tests, macro-structure inspections, radiographic tests ultrasonic testing (only in cases where the renewal method in 5.1.6-1(2) is applied) or notch tensile tests or in the retest prescribed in -1 above are not allowed to retest within one month from the date of failure.**

“Guidance for the survey and construction of steel ships” has been partly amended as follows:

## **Part M      Welding**

### **M5    WELDERS AND THEIR QUALIFICATION TESTS**

#### **M5.1    General**

Paragraph M5.1.6 has been added as follows.

##### **M5.1.6    Renewal of Qualification Certificates**

**1    In cases where the renewal method in 5.1.6-1(2), Part M of the Rules is applied, documents which specify the welding condition (including all essential variables except for base metal thickness) applied as well as the extent of testing are specified is to be submitted.**

**2    A Surveyor is, in principle, to be present during ultrasonic testing.**

**3    With respect to the provisions of 5.1.6-1(2), Part M of the Rules, the welded joints specified in the following (1) through (3) are to be used in qualification tests. In addition, the dimension of a single part to be evaluated is to be not less than the dimensions specified in 5.3.3, Part M of the Rules.**

**(1)    Welded joints welded in accordance with the requirements specified in 5.3.3, Part M of the Rules.**

**(2)    Welded joints of test assemblies which are attached in line with the butts or seams of the finished product, etc. and which are welded at the same time.**

**(3)    Welded joints included in the butts and seams of finished products, etc.**

**4    With respect to the provisions of 5.1.6-1(3), Part M of the Rules, it is preferable that the person who evaluates welds on behalf of a shipyard or manufacturer is themselves qualified in accordance with national or international qualification standards.**