
RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part M **Welding**

RULES

2018 AMENDMENT NO.1

Rule No.100 29 June 2018

Resolved by Technical Committee on 31 January 2018

An asterisk (*) after the title of a requirement indicates that there is also relevant information in the corresponding Guidance.

Rule No.100 29 June 2018

AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

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

Part M WELDING

Chapter 4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

Section 4.2 has been amended as follows.

4.2 Tests for Butt Welded Joints

4.2.1 Application

The requirements in **4.2** apply to the butt welded joints of materials prescribed shown in **Table M4.4** or equivalent materials by a manual, semi-automatic welding or automatic welding method, etc.

(4.2.2 is omitted.)

Table M4.4 Kinds of Butt Welded Joint Test and Number of Specimens

Kind and grade of test assembly		Kinds of test and number of specimens ⁽¹⁾							
		Visual inspection	Tensile test	Bend test	Impact test (sets) ⁽²⁾	Macro-Structure inspection	Hardness test	Non-destructive inspection ⁽³⁾	Measurement of ferrite content at weld surface (point)
Rolled steel for hull	KA, KB, KD, KE KA32, KD32, KE32, KF32, KA36, KD36, KE36, KF36, KA40, KD40, KE40, KF40	Whole length of welding joints	2	4 ⁽⁵⁾	3~8 <a,b,c,d,e> ⁽⁷⁾	1	1 ⁽¹⁰⁾	Whole length of welding joints	=
	KE47				4~8 <a,b,c,d,e> ⁽⁷⁾				
Rolled steels for lower temperature service	KL24A, KL24B, KL27, KL33, KL37, KL2N30, KL3N32, KL5N43 KL9N53, KL9N60		4 ⁽⁴⁾	2 ⁽⁶⁾	5 <A,B,C,D,E> ⁽⁸⁾		1 ⁽¹⁴⁾		
Steel pipes for low temperature service	KLPA, KLPB, KLPC, KLP2, KLP3, KLP9		4						
Rolled steel for structure	KA420, KD420, KE420, KF420, KA460, KD460, KE460, KF460, KA500, KD500, KE500, KF500, KA550, KD550, KE550, KF550, KA620, KD620, KE620, KF620, KA690, KD690, KE690, KF690, KA890, KD890, KE890, KA960, KD960, KE960			2	4 ⁽⁵⁾		3~8 <a,b,c,d,e> ⁽⁷⁾		
Rolled stainless steels	KSUS304, KSUS304L, KSUS304N1, KSUS304N2, KSUS304LN, KSUS309S, KSUS310S, KSUS316, KSUS316L, KSUS316N, KSUS316LN, KSUS317, KSUS317L, KSUS317LN, KSUS321, KSUS329J1, KSUS329J3L, KSUS329J4L, KSUS347 KSUS329J1, KSUS329J3L, KSUS329J4L, KSUS323L, KSUS821L1		4				4		
Stainless steel pipes	K304TP, K304LTP, K309STP, K310STP, K316TP, K316LTP, K317TP, K317LTP, K321TP, K329J1TP, K329J3LTP, K329J4LTP , K347TP K329J1TP, K329J3LTP, K329J4LTP			4 ⁽⁵⁾	—				
Aluminium alloys ⁽¹¹⁾	5000 Series	5754P, 5086P, 5086S ⁽¹²⁾ , 5083P, 5083S ⁽¹²⁾ 5383P, 5383S ⁽¹²⁾ , 5059P, 5059S ⁽¹²⁾ , 5456P	4 ⁽⁵⁾			—			
	6000 Series	6005AS ⁽¹³⁾ , 6061P, 6061S ⁽¹³⁾ , 6082S ⁽¹³⁾							

Notes:

- (1) Where found necessary by the Society, deposited metal tensile test, microscopic test and tests other than those may be required.
- (2) In this Table, the mark in <> specifies position of notch given in Fig. M4.2 through Fig. M4.4.
- (3) Internal inspections by radiographic examination or ultrasonic examination and surface inspections by magnetic particle examination or liquid penetrant examination are to be

carried out.

- (4) Two specimens are to be taken longitudinally and transversely respectively. (See **Fig. M4.1(D)**)
- (5) Two specimens are to be taken from root bend and face bend respectively. (See **Fig. M4.1(A)**, ~~and~~ **(E)** and **(F)**)
- (6) The specimens are to be taken longitudinally. (See **Fig. M4.1(D)**).
- (7) The specimens are to be taken in accordance with **Fig. M4.2** and **M4.3**.
- (8) The position of notch for the specimen is to be shown in **Fig. M4.4**.
- (9) Where found necessary by the Society, impact tests up to steels specially used for may be required.
- (10) For *KA36*, *KD36*, *KE36*, *KF36*, *KA40*, *KD40*, *KE40*, *KF40* and *KE47* the tests are to be carried out.
- (11) All temper conditions indicated with grades are to be included (See **Table K8.3**).
- (12) Rolled products which have the same grade and temper condition may be used.
- (13) Other rolled aluminium alloys of 6000 series with tensile strength 260 N/mm^2 and above may be used.
- (14) The test is to be applied to *KL37*, *KL5N43*, *KL9N53*, *KL9N60* and *KLP9*.

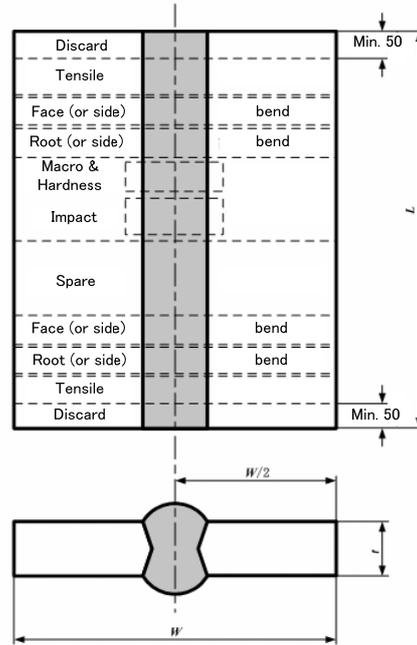
4.2.3 Test Assemblies

(-1 is omitted.)

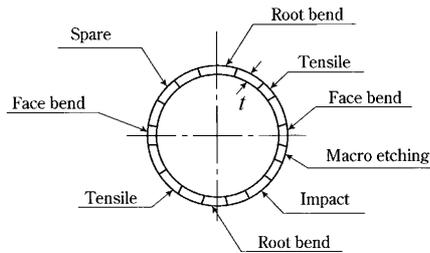
2 The dimensions and types of test assembly are to be as indicated in (A), (B), (C), (D), ~~and~~ (E) and (F) of **Fig. M4.1**

(-3 to -7 are omitted.)

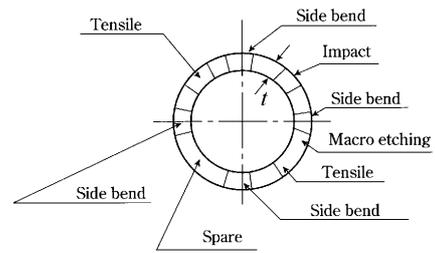
Fig. M4.1 Welding Procedure Qualification Test Assemblies (Unit: mm)



(A) Test Assembly for Plates (materials indicated in (D), ~~and~~ (E) and (F) are excluded)



(B) Test Assembly for Pipes up to 20 mm in Thickness



(C) Test Assembly for Pipes over 20 mm in Thickness

Notes:

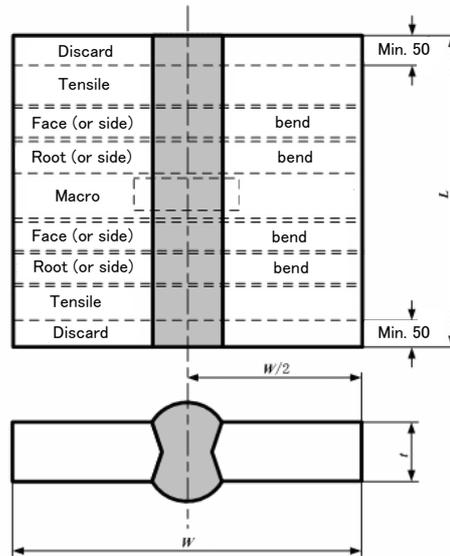
((1) and (2) are omitted.)

(3) Measurement of ferrite content at the weld surface (including weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.4**.

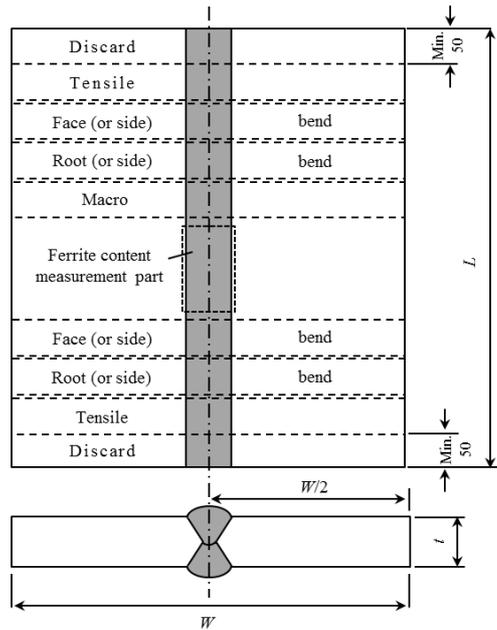
(4) The part measured for ferrite content in **Fig. (B)** and **Fig. (C)** may be an arbitrary selected part of the weld.

Fig. M4.1 Welding Procedure Qualification Test Assemblies (Unit: mm) (continued)

(Fig.(D) is omitted.)



(E) Test Assemblies for ~~Rolled Stainless Steel and~~ Aluminium Alloy Plates



(F) Test Assemblies for Rolled Stainless Steel Plates

Notes:

- (1) In **Fig. (E) and (F)**, width (W) and length (L) of test assembly are as follows.
Manual welding and semi-automatic welding: $W \geq 300 \text{ mm}$, $L \geq 350 \text{ mm}$
Automatic welding: $W \geq 400 \text{ mm}$, $L \geq 1000 \text{ mm}$
- (2) The root and face bends may be substituted by 4 side bends for $t \geq 12 \text{ mm}$.
- (3) For butt joint of dissimilar alloy material, longitudinal bend tests may be required by the Society.
- (4) Measurement of ferrite content at the weld surface (including weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.4**.
- (5) The part measured for ferrite content may be an arbitrary selected part of the weld, excluding any discards.

(Fig.M4.2 to Fig.4.4 are omitted.)

(4.2.4 to 4.2.10 are omitted.)

4.2.11 Measurement of ferrite content at weld surface

1 Measurement of ferrite content at weld surface (including weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.4**.

2 The ferrite content at the weld surface is to be measured for the part specified in **Fig. M4.1** prior to each test.

3 The ferrite content at the weld surface is to be measured by a method using magnetic device as specified in *JIS Z 3119* or an equivalent method. The ferrite content of at least 6 points at different positions along the weld longitudinal direction is to be measured. Measurements are made at least 5 times at each point, and the highest value among the readings is to be used as the measured value. The measurement points are to include a minimum of 3 points in the weld metal and 3 points in the heat affected zone. However, where the width of the heat affected zone is narrow and difficult to carry out measurement, 6 points in the weld metal are to be measured.

4 The value of ferrite content at each measurement point is to be in the range of 30% to 70%.

5 Notwithstanding the requirements given in **-2** to **-4**, for welded joints of different grade of steels or when duplex stainless steel welding consumables are not used, the appropriate measurement points and the value of ferrite content are to be as deemed appropriate by the Society.

4.2.11.12 Retests

(-1 to -4 are omitted.)

5 Where the measurement of the ferrite content at the weld surface fails to meet the requirements, an additional 2 parts on the same test assembly may be retested. In such cases, measurement is to be carried out in accordance with the requirements in **4.2.11-1** and **-2** and all measurement point values are to be within the required range.

5.6 Where the test specimens fail to meet the requirements specified in either of preceding **-1** through **-4.5**, new test specimens are to be welded by changing the welding condition, and to be retest and pass all test items as specified.

Section 4.3 has been amended as follows.

4.3 Tests for Fillet Weld Joints

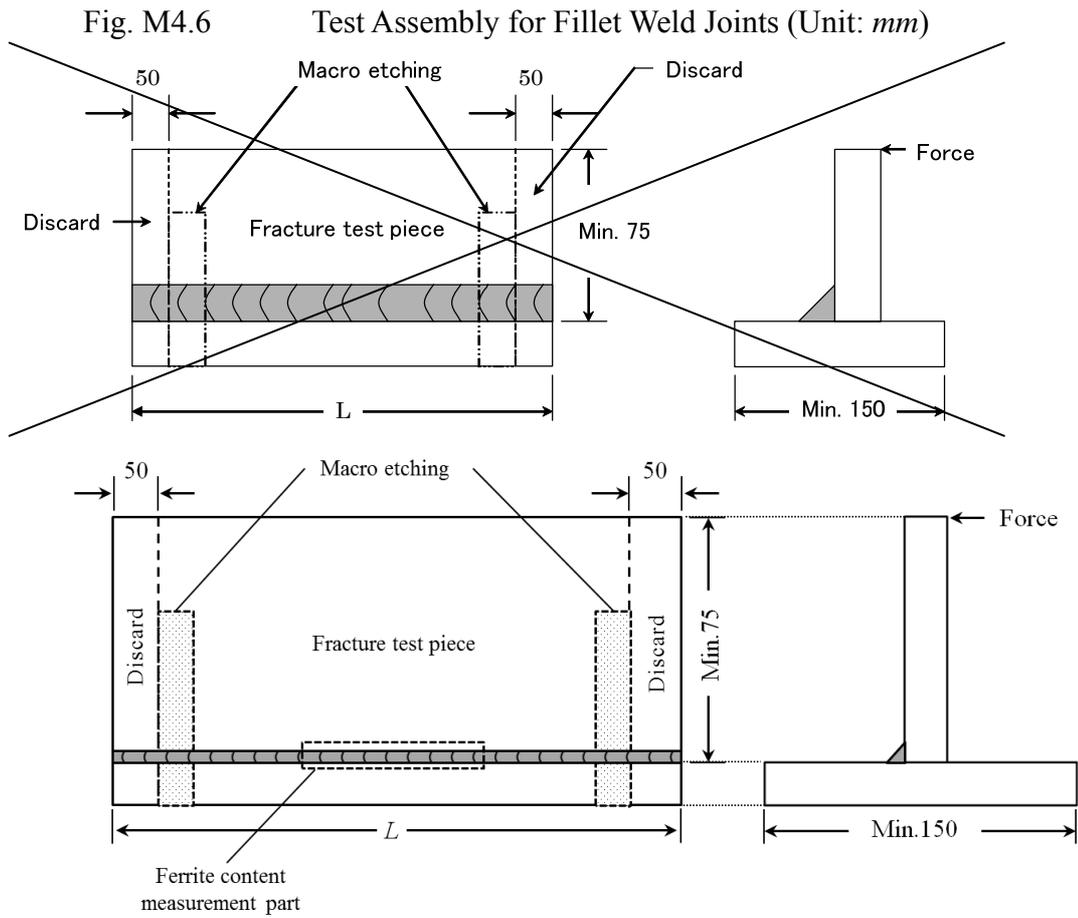
(4.3.1 and 4.3.2 are omitted.)

4.3.3 Test Assemblies and Welding*

(-1 is omitted.)

2 The dimensions and type of test assembly are to be as indicated in **Fig. M4.6**.

(-3 to -6 are omitted.)



Notes:

- (1) The length of test specimen, L is not less than 350mm for manual welding and semi-automatic welding (including gravity welding) and not less than 1,000mm for automatic welding.
- (2) Measurement of ferrite content at the weld surface (including weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.4**.
- (3) The part measured for ferrite content may be an arbitrarily selected part of the weld, excluding any discards.

(4.3.4 to 4.3.8 are omitted.)

4.3.9 Measurement of ferrite content at weld surface

1 Measurement of ferrite content at the weld surface (including weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.4**.

2 The ferrite content at the weld surface is to be measured for the part specified in **Fig. M4.6** in accordance with the requirement in **4.2.11-3 to -5** prior to each test.

4.3.910 Retests

1 Where visual inspection, macro-structure inspection, fracture test or non-destructive inspection test fails, the new test specimens welded under the same welding conditions, are to be subject to retest, and all of these test specimens are to pass the test items specified.

2 Where the hardness test fails, the retest may be correspondingly applied to the requirement in **4.2.112-4**.

3 Where the measurement of the ferrite content at the weld surface fails to meet the requirements, a retest may be carried out by correspondingly applying the requirement in **4.2.12-5**.

Section 4.4 has been amended as follows.

4.4 Tests for T-joints with Full Penetration

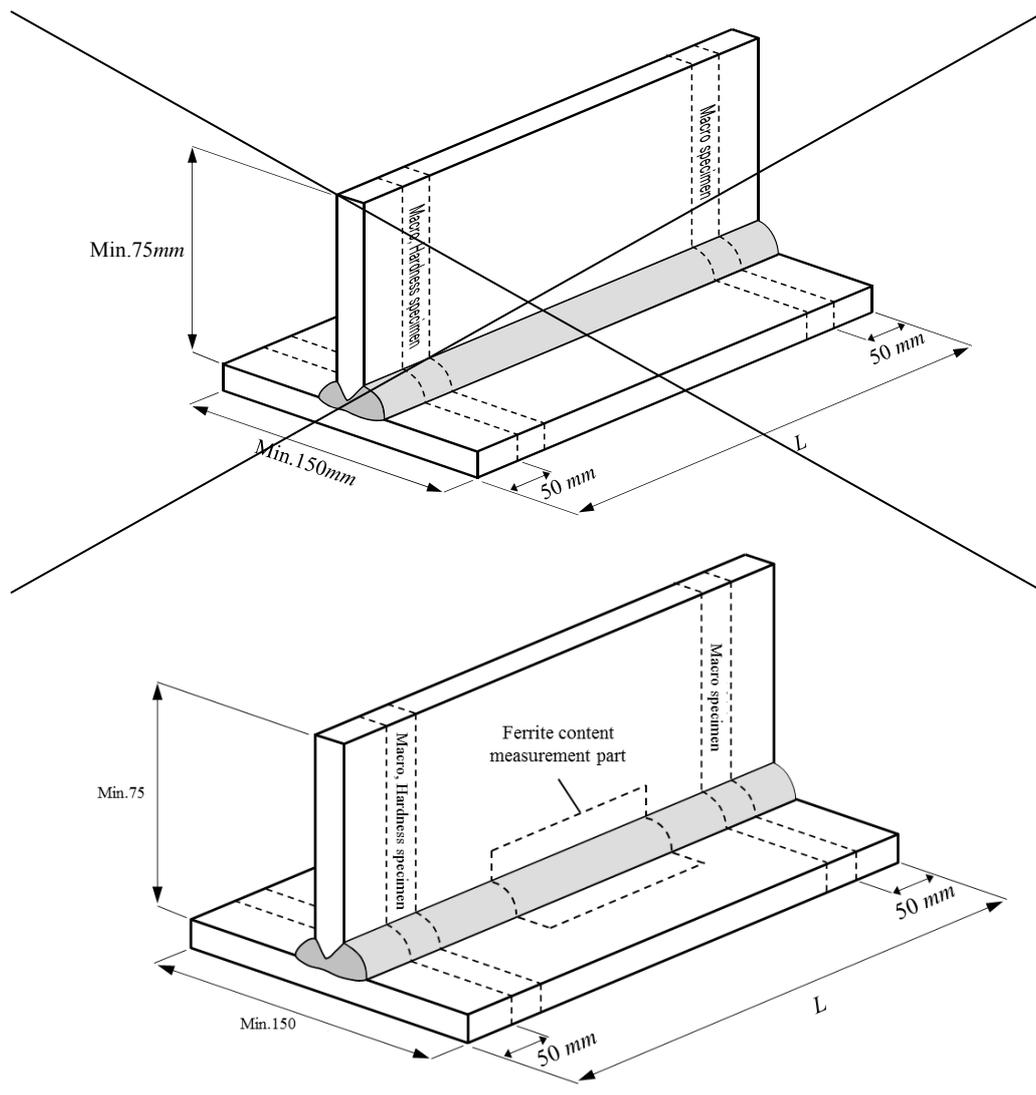
(4.4.1 and 4.4.2 are omitted.)

4.4.3 Test Assemblies

(-1 is omitted.)

2 The dimensions and type of test assembly are to be as indicated in **Fig. M4.8**.

(-3 and -4 are omitted.)



Notes:

- (1) The length of test specimen, L is not less than 350 mm for manual welding and semi-automatic welding and not less than 1,000 mm for automatic welding.
- (2) Measurement of ferrite content at the weld surface (including weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.4**.
- (3) The part measured for ferrite content may be an arbitrary selected part of the weld, excluding any discards.

(4.4.4 to 4.4.7 are omitted.)

4.4.8 Measurement of ferrite content at weld surface

1 Measurement of ferrite content at the weld surface (including weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.4**.

2 The ferrite content at the weld surface is to be measured for the part specified in **Fig. M4.8** in accordance with the requirement in **4.2.11-3 to -5** prior to each test.

4.4.89 Retests

1 Where visual inspection, macro-structure inspection or non-destructive inspection test fails, the new test specimens welded under the same welding conditions, are to be subject to retest, and all of these test specimens are to pass the test items specified.

2 Where the hardness test fails, the retest may be correspondingly applied to the requirement in **4.2.11-4**.

3 Where the measurement of the ferrite content at the weld surface fails to meet the requirements, a retest may be carried out by correspondingly applying the requirement in **4.2.12-5**.

Section 4.5 has been amended as follows.

4.5 Tests for T-joints with Partial Penetration

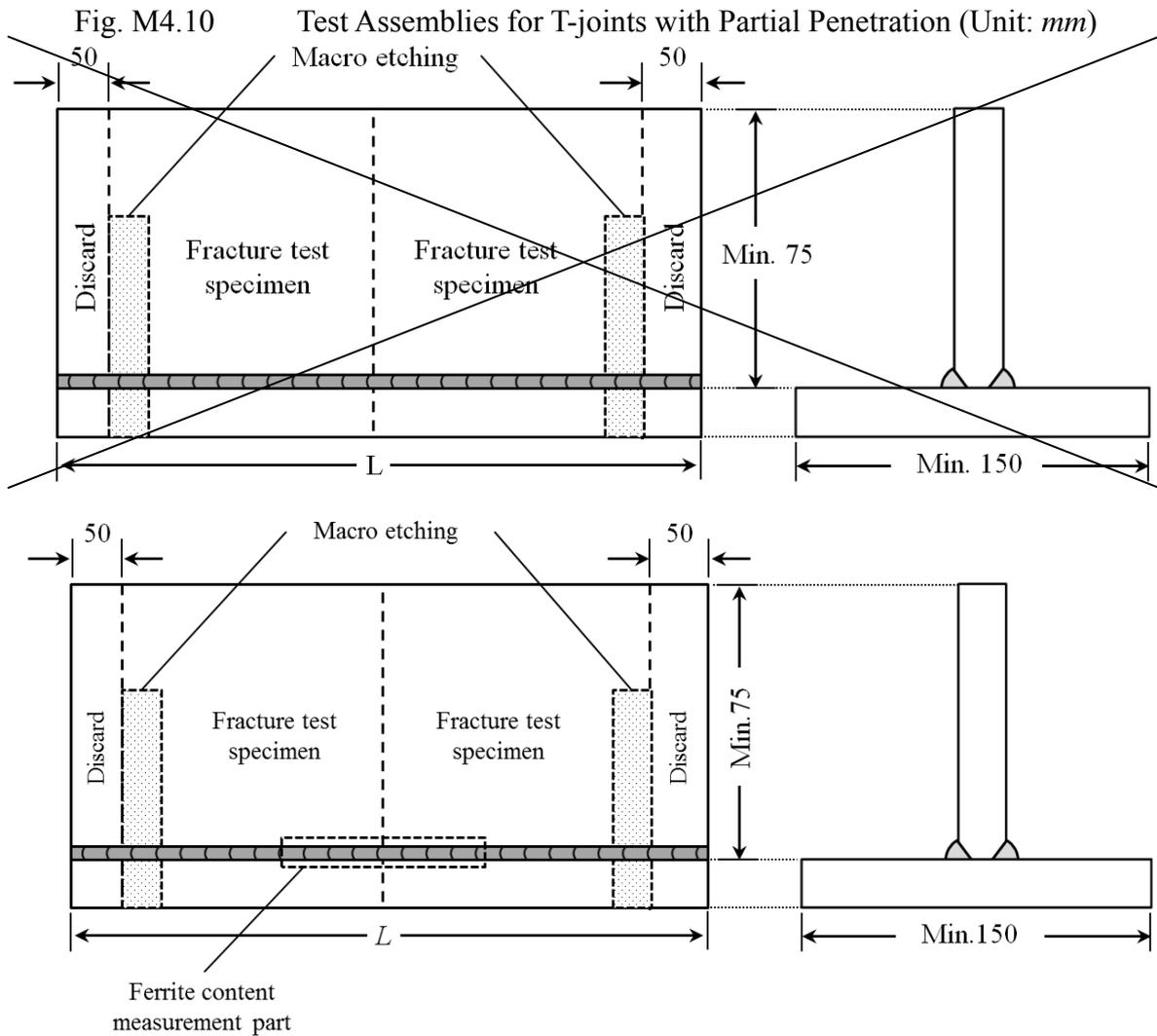
(4.5.1 and 4.5.2 are omitted.)

4.5.3 Test Assemblies

(-1 is omitted.)

2 The dimensions and type of test assemblies are to be as indicated in **Fig. M4.10**.

(-3 and -4 are omitted.)



Notes:

- (1) The length of test assemblies, L is not less than 350 mm for manual welding and semi-automatic welding (including gravity welding) and not less than 1,000 mm for automatic welding.
- (2) Hardness test may be carried out on any section of test assemblies, except for discarded sections.
- (3) Fracture test specimens are, as far as possible, to be taken in equal lengths in the direction of welding direction.
- (4) Measurement of ferrite content at the weld surface (including weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.4**.
- (5) The part measured for ferrite content may be an arbitrarily selected part of the weld, excluding any discards.

(4.5.4 to 4.5.8 are omitted.)

4.5.9 Measurement of ferrite content at weld surface

1 Measurement of ferrite content at the weld surface (including weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.4**.

2 The ferrite content at the weld surface is to be measured for the part specified in **Fig. M4.10** in accordance with the requirement in **4.2.11-3 to -5** prior to each test.

4.5.910 Retests

1 Where finished inspection, macro-structure inspection, fracture test or non-destructive inspection fails, the new test specimens welded under the same welding conditions, are to be subject to retest, and all of these test specimens are to pass the test items specified.

2 Where the hardness test fails, the retest may be correspondingly applied to the requirement in **4.2.112-4**.

3 Where the measurement of the ferrite content at the weld surface fails to meet the requirements, a retest may be carried out by correspondingly applying the requirement in **4.2.12-5**.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 29 June 2018.
2. Notwithstanding the amendments to the Rules, the current requirements apply to welding procedure for which the application is submitted to the Society before the effective date.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part M

Welding

GUIDANCE

2018 AMENDMENT NO.1

Notice No.52 29 June 2018

Resolved by Technical Committee on 31 January 2018

AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

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

Part M WELDING

M4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

M4.1 General

M4.1.4 Range of Approval

Sub-paragraph -4(1) has been amended as follows.

4 For the wording “deemed appropriate by the Society” specified in **4.1.4-4, Part M of the Rules**, the approval of welding procedure and related specifications of rolled stainless steel, aluminium alloys and rolled steels for low temperature service are to comply with the requirements specified in the following **(1)** to **(3)**, provided that the applied welding condition is the same.

(1) Rolled Stainless Steel

For rolled stainless steel, **4.1.4-1** and **-2, Part M of the Rules** (excluding the requirements of large heat input welding) is to be applied. However, the kind of base metal is to be the same as test assembly. Where the provisory requirement specified in **3.5.5-1, Part K of the Rules** is applied, the steel with the specified minimum proof stress less than that of the tested steels may be included. In addition, the heat input, interpass temperature and post-weld heat treatment for *KSUS329J1, KSUS329J3L, KSUS329J4L, KSUS323L, KSUS821L1, K329J1TP, K329J3LTP* and *K329J4LTP* are to be in accordance with the following **(a)** to **(c)**.

(a) Heat input

Heat input of welding for actual work is to comply with the following requirements:

- i) The upper limit of heat input approved is to be 1.25 times the heat input when welding the test assembly, but is not to exceed 35 kJ/cm.
- ii) The lower limit of heat input approved is to be 0.75 times the heat input when welding the test assembly, but is not to exceed 5 kJ/cm.

(b) Interpass temperature

The maximum interpass temperature is to be the one used when welding the test assembly, but is not to exceed 150°C.

(c) Post-weld heat treatment

Post-weld heat treatment is to be avoided.

((2) and (3) are omitted.)

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 29 June 2018.
2. Notwithstanding the amendments to the Guidance, the current requirements apply to welding procedure for which the application is submitted to the Society before the effective date.