RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part M Welding

2020 AMENDMENT NO.1

Rule No.47 30 June 2020

Resolved by Technical Committee on 22 January 2020

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

Rule No.47 30 June 2020
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

Amendment 1-1

Chapter 3 TEST SPECIMENS AND MECHANICAL TESTING PROCEDURES

3.2 Test Specimens

3.2.3 Bend Test Specimens

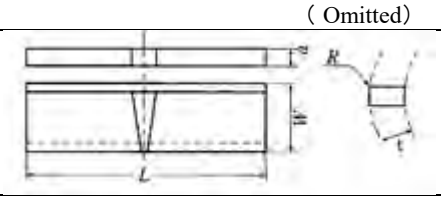
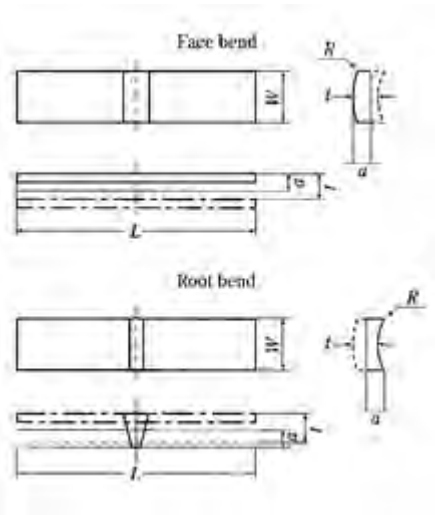
1 Bend test specimens are to be of size and dimensions given in **Table M3.2** and **Table M3.3** according to the kind of test assembly.

2 Where the thickness of test assemblies is greater than the thickness of the bend test specimen prescribed in **Table M3.2**, the face bend or root bend specimen may be machined on its compression side to the specified thickness.

3 Reinforcements and back straps are to be machined flush with base metal.

Table M3.2 has been amended as follows.

Table M3.2 Size and Dimension of Bend Test Specimens(1)

Kind	Used for	Size of specimen		Dimensions	Intended for
（Omitted）					
B-3	Welding procedure qualification test	Side bend specimen		$a = 10$ $W = t$ (2) $L \fallingdotseq 200$ $R \leq 50$	Test assemblies for butt weld test for ~~plate~~ pipe: $t > 20$12
B-4		Face and root bend specimen		$a = t$ $W = 19$ $L \fallingdotseq 200$ $R \leq 1.5$ For the tube whose D is 34.0 to 60.5, W shall be 10, For the tube having D of 34.0 and under, the width obtained by diving the tube longitudinally into four equal parts shall be the width of the test piece.	Test assemblies for butt weld test for pipe: $t < 10$
B-5				$a = 10$ $W = 40$ $L \fallingdotseq 200$ $R \leq 1.5$ For the tube having an D of 114.3 and under, W shall be 19.	Test assemblies for butt weld test for pipe: $10 \leq t \leq 20$
（Omitted）					

Chapter 4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

4.1 General

4.1.1 Application*

Sub-paragraph -1 has been amended as follows.

1 The requirements in this Chapter are to be applied to the approval of welding procedure and related specifications mainly for hull construction as well as pipes and piping systems, etc., unless specified in another chapter.

4.1.2 Approval of Welding Procedure and Related Specifications

Sub-paragraph -1 has been amended as follows.

1 The manufacturer is to obtain the approval of the welding procedures in the following cases specified in **(1)** through **(~~3~~4)**.

(1) Where the welding procedures are first adopted for welding works specified in **Chapter 2**.

(2) Where the welding procedures are first adopted for pipes belonging to Group I and II, piping systems for ships carrying dangerous chemicals in bulk, and cargo and process piping systems for ships carrying liquefied gases in bulk.

(~~2~~3) Where the items described in the approved welding procedure specifications are altered.

(~~3~~4) Where considered necessary by the Surveyor.

4.1.3 Execution of Tests*

Sub-paragraph -1 has been amended as follows.

1 For the approval of welding procedure and related specifications, the tests specified in **4.2** to **4.~~5~~6** are to be carried out based on the representing conditions, such as the edge preparation, welding parameter, etc., described in the welding procedure specification, with satisfactory results. However, for high strength rolled steels for offshore structures, the tests are to be carried out for every kind of heat treatment.

4.1.4 Range of Approval*

Sub-paragraph -2 has been amended as follows.

2 The scope of approval of the welding procedure and related specifications of steel pipes are to be in accordance with the following **(1)** through **(7)** on the condition that the other welding conditions are the same.

(1) Kind of weld joint
The kind of weld joint is to be in accordance with in **Table M4.1**. Set-on, Set-in and Set-through may be accepted regardless of the kind of pipe assembly used in the test except in the case of butt-welded joints.

(2) Thickness
The range of the thickness is to be in accordance with in **Table M4.2**.

(3) Outside diameter
(a) The range of the outside diameter is to be in accordance with in **Table M4.4**.

(b) In cases where plates are used as the test assembly in accordance with **4.2.3-4**, the lowest limit of the range is to be not less than 300 *mm*, notwithstanding **(a)**.

(4) Angles of pipe (or tube) fittings

The angles of pipe (or tube) fittings are not to be less than the angle of test assemblies or 60 degrees, whichever smaller, but is to be not more than 90 degrees. "Angles of pipe (or tubes) fittings" means the angle in "α" degrees between the centrelines of pipes (or tubes), or between pipes (or tubes) and plates on transverse sections as shown in **Fig. M4.13**.

(~~4~~5) Leg length of fillet welding

The range of the leg length of fillet welding is to be in accordance with in **Table M4.3**.

(~~5~~6) Kind of base metal

(a) The kinds of steel tubes for boilers and heat exchangers, steel pipes for pressure piping, headers and steel pipes for low temperature service are to be as specified in **Table M4.5**.

(b) Other than for the pipes specified in **(a)**, the welding procedures are considered applicable only for grades which are the same as the grade of the test assembly.

(~~6~~7) Kind of welding consumable

The welding consumable is to be selected according to grade (including all suffixes) not brand, except for the large heat inputs specified in **Note (5) of Table M4.2**.

(~~7~~8) Welding position

(a) The welding position is to be in accordance with **Table M5.11**. The welding position of T-joints with partial penetration and full penetration is to be the same as the welding position for fillet weld joints.

(b) Approval tests are to be performed each welding position. However, to qualify a range of positions, test assemblies are to be welded for highest heat input position and lowest heat input position and all applicable tests are to be made on those assemblies. The above excludes welding in the tube position for welding downwards which will always require separate tests and only are acceptable for that position. With respect to the welding positions for rotating and fixed pipes (tubes), when the tests required for fixed pipes (tubes) are performed, the tests required for rotating pipes (tubes) may be also be considered to have been performed as shown in **Table M5.11**.

Table M4.2 has been amended as follows.

Table M4.2 Approved Range of Thickness(1), (~~8~~9)

Thickness of test assemblies t (*mm*) (2), (3), (4), (5)	Approved range of thickness (*mm*) (~~9~~10)			
	Butt welding(4)			Fillet welding
	Multi-run technique	Single-run technique or Two-run technique(~~10~~11)	Large heat input welding process(~~5~~6)	
$t \leq 100$	0.5t to 2t (~~6~~7), (~~7~~8) (100 max)	0.7t to 1.1t (~~6~~7), (~~7~~8) (100 max)	0.7t to t	0.5t to 2t (~~6~~7), (~~7~~8) (100 max)

Notes:

(1) Welding procedure used by dissimilar process (combination welding) is to be correspondingly applied to **Table M4.2**. In this case, thickness or throat thickness of each welding method is to be *t*.

(2) For unequal plate thickness or pipe wall thickness of butt welds the lesser thickness is ruling dimension.

(3) For fillet welds, the range of approval shall be applied to the web thickness and flange thickness of test piece.

(4) For T-joints with full penetration and T-joints with partial penetration, *t* is the thickness of test assembly on the open edge side and the requirements ~~are~~to be correspondingly applied ~~to~~are the requirements ~~of~~for butt welding.

(5) For branch connections, *t* is the thickness of main pipes and branch pipes respectively, and the requirements to be correspondingly applied are the requirements for butt welding.

(~~5~~6) Large heat input welding means the welding with a welding heat input of not less than 50 *kJ/cm*.

(~~6~~7) For the vertical-down welding and tube positions for welding downwards, the test piece thickness *t* is always taken as the upper limit of the range of application.

(~~7~~8) For test assembly thickness not more than 12 *mm*, the specified minimum content is not applicable.

(~~8~~9) For the kinds of test assemblies specified in **Table M4.12**, even though the test specimen has passed the hardness test specified in **4.2.9**, **4.3.6** and **4.4.6**, the upper limit of the thickness range of approval is to be restricted to the thickness of the test assembly when three or more of the hardness values in the heat affected zone are less than 25*HV* lower than the values specified in **Table M4.12**.

(~~9~~10) For steel pipes for low temperature service, the upper limit is to be a maximum of 25 *mm* unless another value is considered appropriate by the Society.

(1~~0~~1) Two-run technique refers to a welding process involving a single pass on both sides.

Table M4.4 has been amended as follows.

Table M4.4 Range of Approval Related to Outside Diameter of Pipe

Outside diameter *D* of test assembly (*mm*)(1)	Range of approval related to outside diameter (*mm*) (2)
D ≦ 25	0.5 *D* to 2 *D*
D ＞ 25	0.5 *D* or more(~~2~~3)

Notes:

(1) For non-circular sections, *D* is the dimension of the smaller side.

(2) For branch connections, the requirements are applied to main pipes and branch pipes.

(~~2~~3) Lower limit of "0.5 *D*" is not to be less than 25 *mm*.

Table M4.5 has been amended as follows.

Table M4.5 Range of Approval Related to Kind of ~~Pipe~~Steel

Kind and grade of test assembly		Approval range of grade
Steel tubes for boilers and heat exchangers	*KSTB*33	*KSTB*33
	*KSTB*35	*KSTB*33, *KSTB*35
	*KSTB*42	*KSTB*33(2), *KSTB*35(2), *KSTB*42 ~~*KSTPG*38, *KSTS*38, *KSTPT*38~~ ~~*KSTPG*42, *KSTS*42, *KSTPT*42~~ ~~*KBH* 1~~
	*KSTB*12	*KSTB*12 ~~*KSTPA*12~~ ~~*KBH* 3~~
	*KSTB*22 ~~*KSTB*23~~	*KSTB*22~~, *KSTB*23~~ ~~*KSTPA*22, *KSTPA*23~~ ~~*KBH* 4, *KBH* 5~~
	*KSTB*23	*KSTB*23
	*KSTB*24	*KSTB*24 ~~*KSTPA*24~~ ~~*KBH* 6~~
Steel pipes for pressure piping	*KSTPG*38 *KSTS*38 *KSTPT*38	~~*KSTB*33, *KSTB*35~~ *KSTPG*38, *KSTS*38, *KSTPT*38
	*KSTPG*42 *KSTS*42 *KSTPT*42	~~*KSTB*33(2), *KSTB*35(2)~~ *KSTPG*38, *KSTS*38, *KSTPT*38 *KSTPG*42, *KSTS*42, *KSTPT*42 ~~*KBH* 1~~
	*KSTS*49 *KSTPT*49	*KSTPG*38(2), *KSTS*38(2), *KSTPT*38(2) *KSTPG*42, *KSTS*42, *KSTPT*42 *KSTS*49, *KSTPT*49 ~~*KBH* 1(2), *KBH* 2~~

	*KSTPA*12	~~*KSTB12*~~ *KSTPA*12 ~~*KBH-3*~~
	*KSTPA*22 ~~*KSTPA23*~~	~~*KSTB22*, *KSTB23*~~ *KSTPA*22~~, *KSTPA23*~~ ~~*KBH-4*, *KBH-5*~~
	*KSTPA*23	*KSTPA*23
	*KSTPA*24	~~*KSTB24*~~ *KSTPA*24 ~~*KBH-6*~~
Headers	*KBH*-1	~~*KSTB33*, *KSTB35*~~ *KBH*-1
	KBH-2	~~*KSTB33*~~[2]~~, *KSTB35*~~[2] ~~*KSTPG38*, *KSTS38*, *KSTPT38*~~ *KBH*-1，*KBH*-2
	KBH-3	~~*KSTB12*~~ ~~*KSTPA12*~~ *KBH*-3
	KBH-4 ~~*KBH-5*~~	~~*KSTB22*, *KSTB23*~~ ~~*KSTPA22*, *KSTPA23*~~ *KBH*-4~~, *KBH-5*~~
	KBH-5	*KBH*-5
	KBH-6	~~*KSTB24*~~ ~~*KSTPA24*~~ *KBH*-6
Steel pipes for low temperature service[1]	(Omitted)	(Omitted)

Notes: (Omitted)

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 M4.6** or equivalent materials by a manual, semi-automatic welding or automatic welding method, etc.

Table M4.6 has been amended as follows.

Table M4.6 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	(Omitted)		Whole length of welding joints	2	4[5]	3〜8<*a*,*b*,*c*,*d*,*e*>[7]	1	1[10]	Whole length of welding joints	—
	*KE*47					4〜8<*a*,*b*,*c*,*d*,*e*>[7]				
Rolled steels for lower temperature service	(Omitted)					5 <*A*,*B*,*C*,*D*,*E*>[8]		1[14]		
	*KL9N*53, *KL9N*60			4[4]	2[6]					
Steel pipes for low temperature service	*KLPA*, *KLPB*, *KLPC*, *KLP*2, *KLP*3, *KLP*9			2	4					
Rolled steel for structure	(Omitted)				4[5]	3〜8<*a*,*b*,*c*,*d*,*e*>[7]		1		
Steel tubes for boiler and heat exchangers	*KSTB*33, *KSTB*35, *KSTB*42, *KSTB*12, *KSTB*22, *KSTB*23, *KSTB*24					—		—		
Steel pipe for pressure piping	*KSTPG*38, *KSTPG*42, *KSTS*38, *KSTS*42, *KSTS*49, *KSTPT*38, *KSTPT*42, *KSTPKT*49, *KSTPA*12, *KSTPA*22, *KSTPA*23, *KSTPA*24									
Headers	*KBH*-1, *KBH*-2, *KBH*-3, *KBH*-4, *KBH*-5, *KBH*-6									
Rolled stainless steels	(Omitted)					(9)		—		
	*KSUS*329*J*1, *KSUS*329*J*3*L*, *KSUS*329*J*4*L*, *KSUS*323*L*, *KSUS*821*L*1									6 min.
Stainless steel pipes	(Omitted)				4					—
	*K*329*J*1*TP*, *K*329*J*3*LTP*, *K*329*J*4*LTP*									6 min.
Aluminium alloys [11]	5000 Series	(Omitted)			4[5]	—				—
	6000 Series	(Omitted)								

Notes: (Omitted)

Paragraph 4.2.3 has been amended as follows.

4.2.3 Test Assemblies and Welding

1 (Omitted)

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

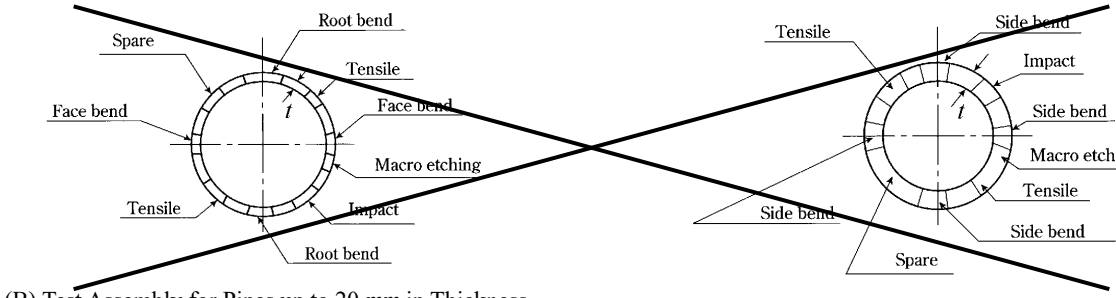
(-3 to -7 are omitted.)

Fig. M4.1 has been amended as follows.

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

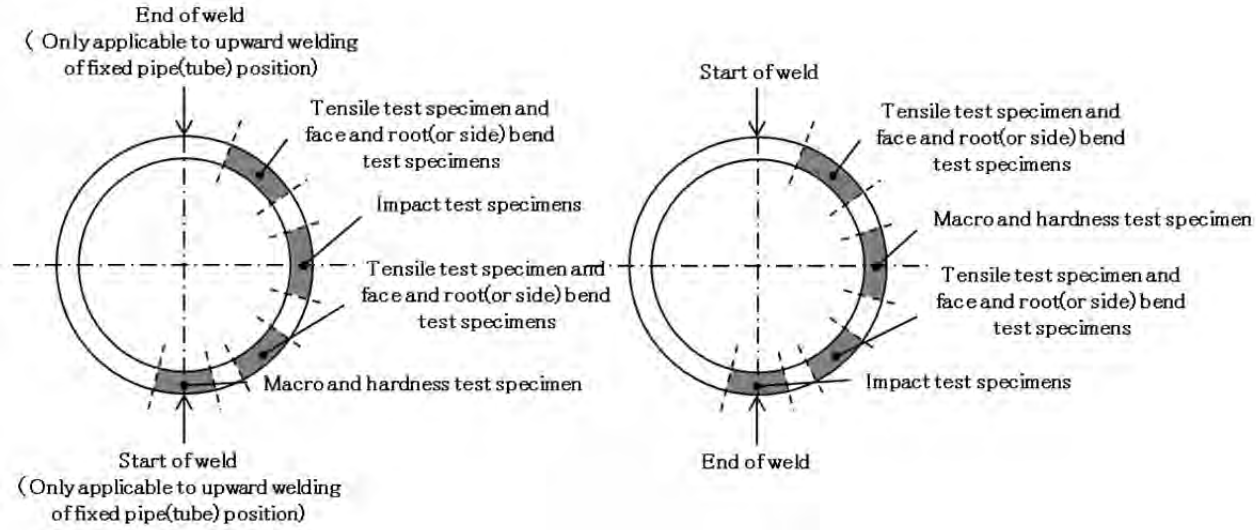
(Figure is omitted.)

(A) Test Assembly for Plates (materials indicated in **(D)**, **(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~~



(B) Test Assembly for pipes (or tubes) (except for the welding position shown in (C))

(C) Test Assembly for pipes (or tubes) (downward welding of fixed pipe (or tube) position)

Notes:

(1) In **Fig. (A)**, width (W) and length (L) of test specimens are as follows.
Manual welding and semi-automatic welding: $W \geq 300$ *mm*, $L \geq 350$ *mm*
Automatic welding: $W \geq 400$ *mm*, $L \geq 1000$ *mm*

(2) The two root and two face bends~~-~~ test specimens may be substituted by ~~4~~four side bends~~-~~ specimens for $t \geq 12$ *mm*.

(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 M4.6**.

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

(5) The start and end points of the weld in **Fig. (B)** may be an arbitrary selected except in the case of the upward welding horizontally fixed pipe (or tube) position.

((D) to (F) are omitted.)

4.3 Tests for Fillet Weld Joints

Paragraph 4.3.1 has been amended as follows.

4.3.1 Application*

1 The requirements in **4.3** apply to the fillet weld joints of materials prescribed in shown in **Table M4.6** or equivalent materials welded by a manual, semi-automatic or automatic welding method, etc.

2 The requirements for branch connections in **4.6** are applicable in cases where the angles of the pipe (or tube) fittings of test assemblies are less than 90 degrees.

Paragraph 4.3.2 has been amended as follows.

4.3.2 Kinds of Test*

Fillet weld joints are to be subjected to finished inspection, macro-structure inspection, hardness test, fracture, ~~and~~ non-destructive inspection test and measurement of ferrite content at the weld surface. Additional tests may be required if found necessary by the Society.

4.3.3 Test Assemblies and Welding*

Sub-paragraph -5 has been amended as follows.

1 Test assembly is to be prepared with the same or equivalent material used in the actual work.

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

3 Test assemblies are to be welded in the general conditions specified in welding procedure specifications.

4 The assembly is to be welded on one side only, except in case deemed necessary by the Surveyor.

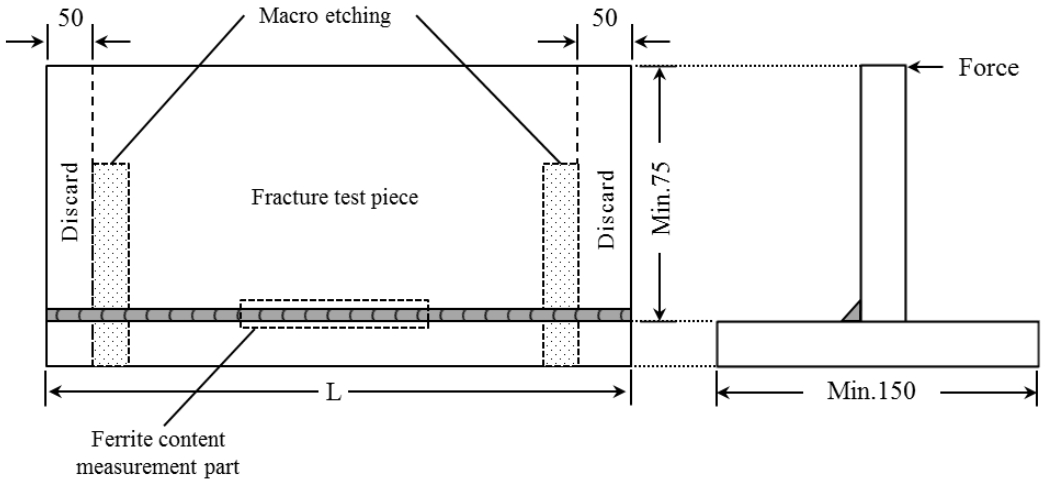
5 In case wheres the test assembly is a plate, ~~F~~for manual and semi-automatic welding, a stop/restart should be included in middle of the test assemblies in longitudinal direction.

6 The tack welds of test piece are to be the same procedure as actual work.

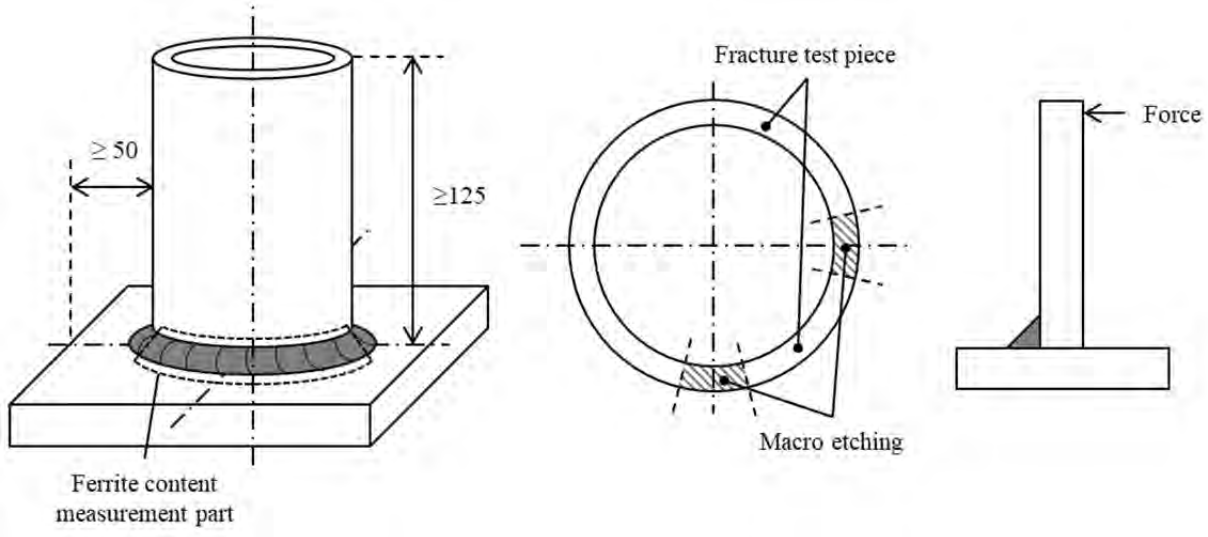
Fig. M4.6 has been amended as follows.

Fig. M4.6 Test Assembly for Fillet Weld Joints (Units: *mm*)

(a) Plate(1)(2)(3)(4)(7)



(b) Pipe (or Tube)(2)(3)(4)(5)(6)(7)



Notes:

(1) The length of test specimen, *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) 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 M4.6**.

(3) The part measured for ferrite content may be an arbitrarily selected part of the weld, excluding any discards.

(4) The thickness of a plate (or pipe) and the thickness of a flange may be different.

(5) The dimensions of flange material are arbitrary. However, the distance between the outer circle of a pipe (or tube) and the end of a flange is not to be less than 50 *mm* at the surface of the flange.

(6) For the upward welding and downward welding horizontally fixed pipe (or tube) positions, macro-structure specimens are to be taken from the bottoms and sides of test assemblies.

(7) Hardness tests may be carried out using one of the macro-structure specimens. In the case of the upward welding horizontally fixed pipe (or tube) position, macro-structure specimens are to taken from the bottoms of test assemblies; however, in the case of the downward welding horizontally fixed pipe (or tube) position, macro-structure specimens are to be taken from the sides of test assemblies.

Paragraph 4.3.7 has been amended as follows.

4.3.7 Fracture Tests

1 In cases where the test assembly is a plate, two (2) test specimens are to be taken from the remainder of the test assembly after the macro-structure specimen has been removed.

2 In cases where the test assembly is a pipe (or tube), an appropriate number of test specimens is to be taken from the remainder of the test assembly after the macro-structure specimen has been removed.

3 The ~~remaining~~ test assemblies ~~after the macro-structure specimen has been removed~~ are to be broken by pressing as shown in **Fig. M4.6**, without cracks, poor penetrations, blow holes and injurious defects in the fractured surface. Where, however, the sum of lengths having blow holes (include poor penetrations), except at both ends of the specimen (only for plate test assemblies), is not greater than 10% of the total welded length, the test may be regarded as satisfactory.

4.4 Tests for T-joints with Full Penetration

Paragraph 4.4.1 has been amended as follows.

4.4.1 Application

1 The requirements in **4.4** apply to the T-joints with full penetration of materials prescribed in **Table M4.6** or equivalent materials welded by a manual, semi-automatic or automatic welding method, etc.

2 The requirements for branch connections in **4.6** are applicable in cases where the angles of the pipe (of tube) fittings of test assemblies are less than 90 degrees.

Paragraph 4.4.2 has been amended as follows.

4.4.2 Kinds of Test

T-joints with full penetration are to be subjected to finished inspection, macro-structure inspection, hardness test ~~and~~, non-destructive inspection test and the measurement of ferrite content at the weld surface.

Paragraph 4.4.3 has been amended as follows.

4.4.3 Test Assemblies and Welding

1 (Omitted)

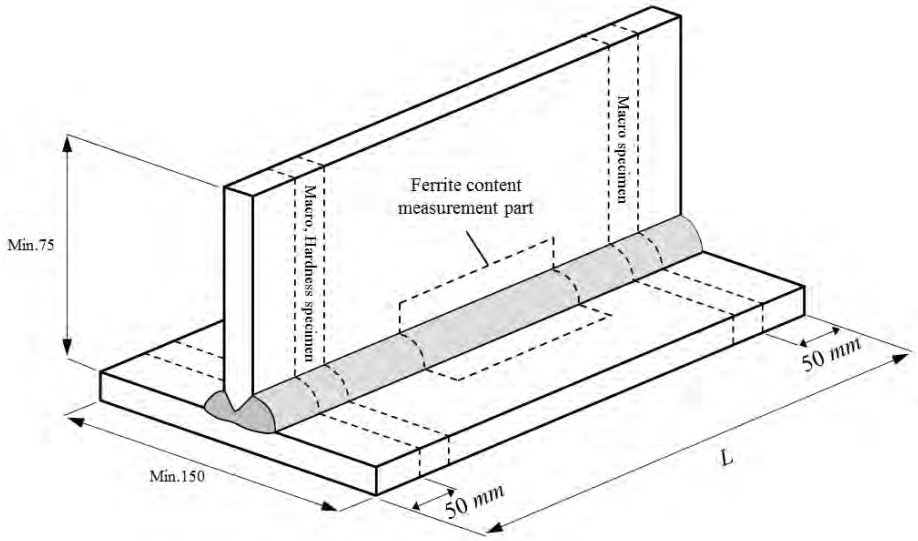
2 The dimensions and type of test assembly are to be as indicated in **Fig. M4.8**.

(-3 and -4 are omitted.)

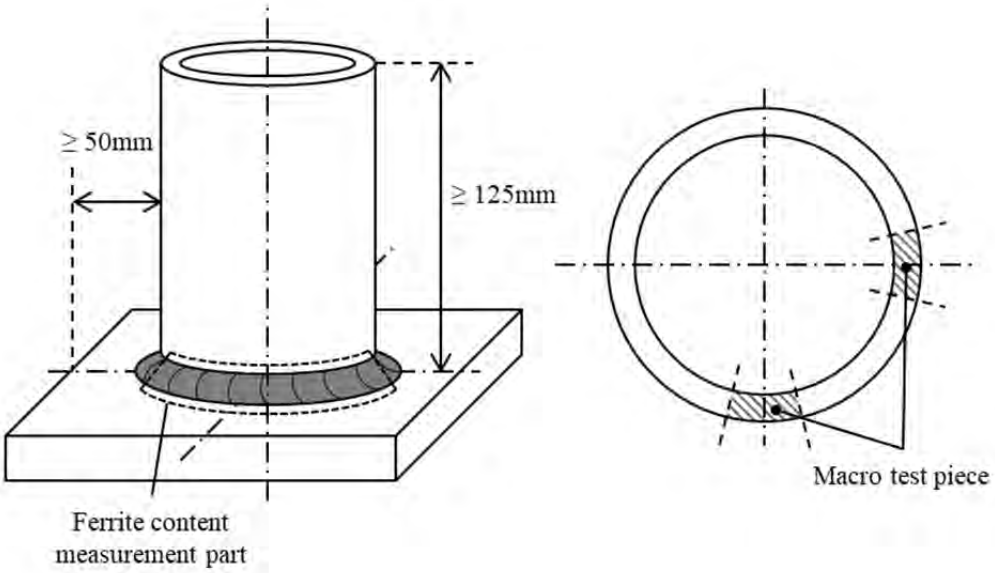
Fig. M4.8 has been amended as follows.

Fig. M4.8 Test Assembly for T-joints with Full Penetration

(a) Plate(1)(2)(3)(4)(7)



(b) Pipe (or Tube)(2)(3)(4)(5)(6)(7)



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 M4.6**.

(3) The part measured for ferrite content may be an arbitrary selected part of the weld, excluding any discards.

(4) The thickness of a plate (or pipe) and the thicknesses of a flange may be different.

(5) The dimensions of flange material are arbitrary. However, the distance between the outer circle of a pipe (or tube) and the end of flange is not to be less than 50 *mm* at the surface of the flange.

(6) For the upper welding and downward welding horizontally fixed pipe (or tube) positions, macro-structure specimens are to be taken from the bottoms and sides of test assemblies.

(7) Hardness tests may be carried out using one of the macro-structure specimens. In the case of the upward welding horizontally fixed pipe (or tube) position, macro-structure specimens are to be taken from the bottoms of test assemblies; however, in the case of the downward welding horizontally fixed pipe (or tube) position, macro-structure

specimens are to be taken from sides of the test assemblies.

4.5 Tests for T-joints with Partial Penetration

Paragraph 4.5.1 has been amended as follows.

4.5.1 Application

1 The requirements in **4.5** apply to the T-joints with partial penetration of materials prescribed in **Table M4.6** or equivalent materials welded by a manual, semi-automatic or automatic welding method, etc.

2 The requirements for branch connections in **4.6** are applicable in cases where the angles of the pipe (or tube) fittings of test assemblies are less than 90 degrees.

Paragraph 4.5.2 has been amended as follows.

4.5.2 Kinds of Test

T-joints with partial penetration are to be subjected to finished inspection, macro-structure inspection, fracture test, hardness test ~~and~~, non-destructive inspection and measurement of ferrite content at the weld surface. Additional tests may be required if found necessary by the Society.

4.5.3 Test Assemblies and Welding

1 Test assemblies are to be prepared with the same or equivalent material used in the actual work.

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

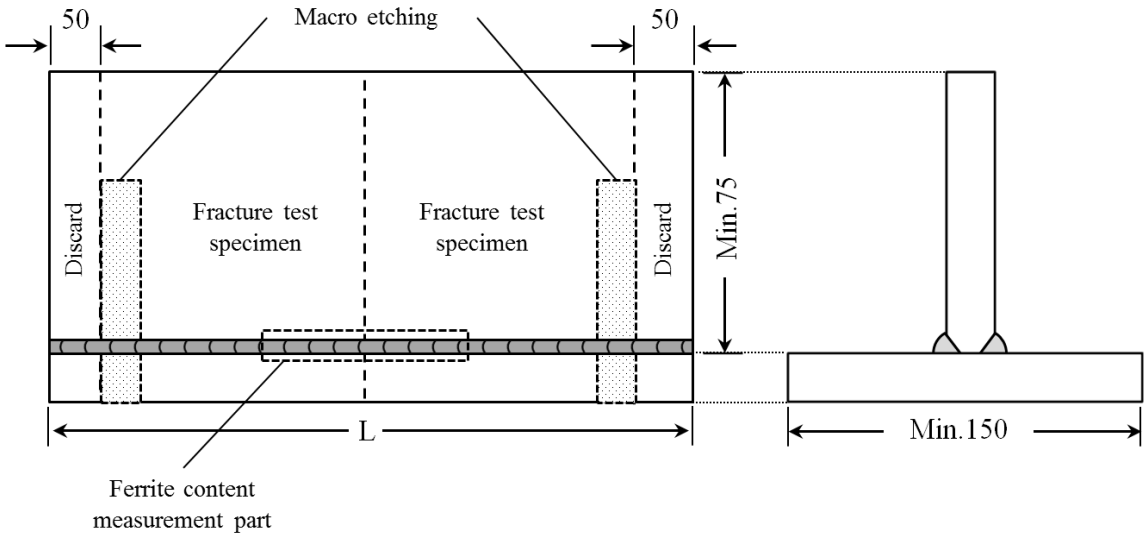
3 Test assemblies are to be welded in the general conditions specified in welding procedure specifications.

4 The tack welds of test assemblies are to be the same procedure as the actual work.

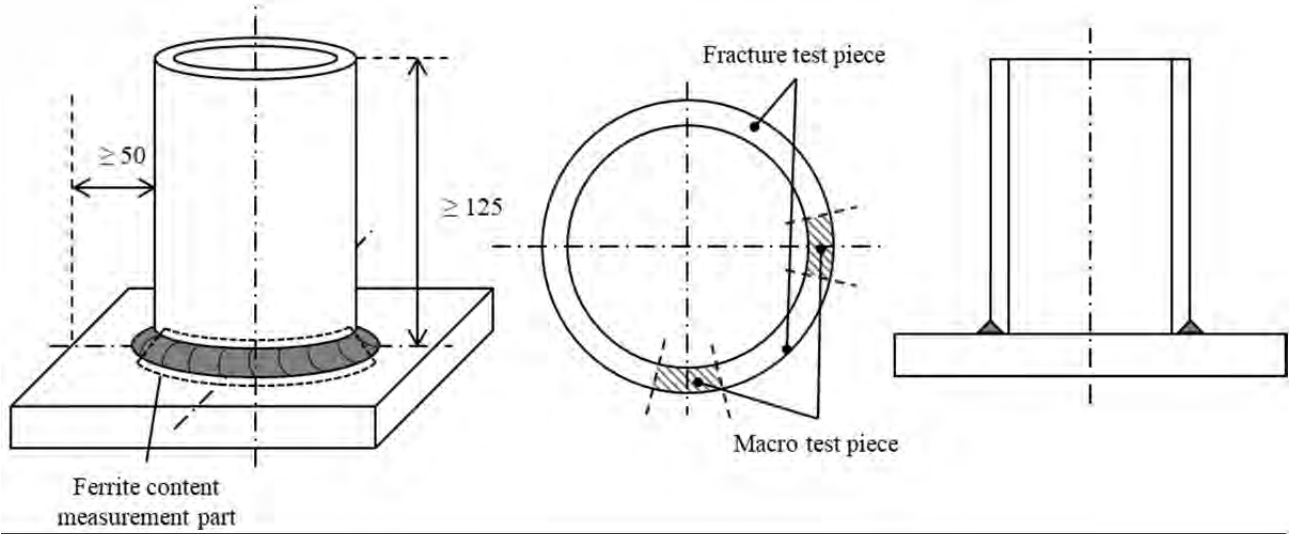
Fig. M4.10 has been amended as follows.

Fig. M4.10 Test Assemblies for T-joints with Partial Penetration (Unit: *mm*)

(a) Plate(1) (3)(4)(5)(6)



(b) Pipe (or Tube)(2)(3)(5)(6)(7)(8)



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) For the upward welding and downward welding horizontally fixed pipe (or tube) positions, macro-structure specimens are to be taken from the bottoms and sides of test assemblies.

(~~2~~3) Hardness tests may be carried out ~~on any section of test assemblies, except for discarded sections.~~using one of the macro-structure specimens. In the case of the upward welding horizontally fixed pipe (or tube) position, macro-structure specimens are to be taken from the bottoms of test assemblies; however, in the case of the downward welding horizontally fixed pipe (or tube) position, macro-structure specimens are to be taken from the sides of test assemblies.

(~~3~~4) Fracture test specimens are, as far as possible, to be taken in equal lengths in the direction of welding direction.

(~~4~~5) 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 M4.6**.

(~~5~~6) The part measured for ferrite content may be an arbitrarily selected part of the weld, excluding any discards.

(7) The thickness of a plate (or pipe) and the thickness of a flange may be different.

(8) The dimensions of flange material are arbitrary. However, the distance between the outer circle of a pipe (or tube) and the end of a flange is not to be less than 50 *mm* at the surface of the flange.

Paragraph 4.5.7 has been amended as follows.

4.5.7 Fracture Tests

1 In cases where the test assembly is a plate, ~~T~~two test specimens are to be taken from the remaining test assembly after the macro-structure specimens have been taken.

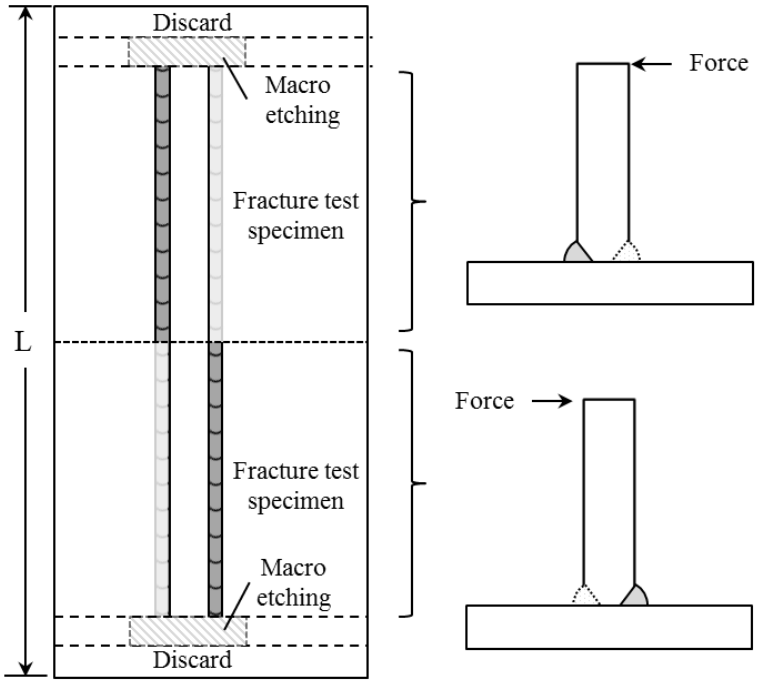
2 In cases where the test assembly is a pipe (or tube), an appropriate number of test specimens is to be taken from the remainder of the test assembly after the macro-structure specimen has been removed.

~~**2**~~**3** Test specimens are to be broken by pressing as shown in **Fig. M4.12**, and be without cracks, poor penetrations, blow holes and injurious defects in the fractured surface. However, in cases where , the sum of lengths having blow holes (include poor penetrations), except at both ends of the specimen (only for plate test assemblies), is not greater than 10% of the total welded length, the test may be regarded as satisfactory.

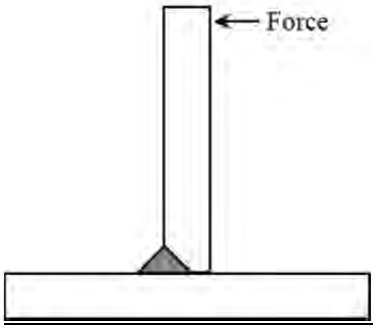
Fig. M4.12 has been amended as follows.

Fig. M4.12 Fracture Test (Unit: *mm*)

(a) Plate[(1)]



(b) Pipe (or Tube)



Note:

(1) Welding is to be removed from the side where force is applied.

Section 4.6 has been added as follows.

4.6 Tests for branch connection

4.6.1 Application

The requirements in **4.6** apply to the branch connections of the materials prescribed in **Table M4.6** or equivalent materials welded by a manual, semi-automatic or automatic welding method, etc. in cases where the angles of pipe (or tube) fittings are less than 90 degrees, as prescribed in **4.3.1-2**, **4.4.1-2** and **4.5.1-2**.

4.6.2 Kinds of Test

Branch connections are to be subjected to finished inspections, macro-structure inspections, fracture tests, hardness tests, non-destructive inspections and measurements of ferrite content at the weld surface.

4.6.3 Test Assemblies and Welding

1 Test assemblies are to be prepared with the same or equivalent material used in the actual work.

2 The dimensions and types of test assemblies are to be as indicated in **Fig. M4.13**.

3 The joints of test assemblies are to be welded by as T-joints with partial penetration, T-joints with full penetration or fillet weld joints, whichever is used in the actual work.

4 The kinds of joint assemblies of test assemblies are to be Set-on, Set-in or Set-through, whichever is used in the actual work.

5 Test assemblies are to be welded in accordance with the general conditions specified in the welding procedure specifications.

6 The tack welds of test assemblies are to be of the same procedure as the actual work.

4.6.4 Finished Inspection

Welded surfaces are to be regular and uniform, and are to be free from injurious defects, such as cracks, undercuts, overlaps, etc.

4.6.5 Macro-structure Inspection

1 The transverse section of test specimens taken from the welded joint is to be etched and examined, and is to show that there are no crack, poor penetration, lack of fusion and other injurious defects.

2 Macro examinations are to include about 10 *mm* of unaffected base metal.

4.6.6 Hardness Test

1 Vickers hardness is to be measured at the positions shown in **Fig. M4.7**, **Fig. M4.9** or **Fig. M4.11**. The kinds of specimens for Vickers hardness are to be in accordance with the requirements specified in **Table M4.12**.

2 The number of specimens for hardness tests is to be in accordance with the requirements specified in **Table M4.6**.

4.6.7 Non-destructive Inspection

1 Internal inspections by radiographic examination or ultrasonic examination, and surface inspections by magnetic particle examination or liquid penetrant examination are to be carried for the whole length of the welding. The results of non-destructive inspections are to show that there are no cracks, poor penetration, lack of fusion and other injurious defects. For T-joints with partial penetration and fillet weld joints, fracture tests may be accepted instead of radiographic examination or ultrasonic examination. In such cases, the fracture test may be carried out by correspondingly applying the requirements in **4.3.7** or **4.5.7**.

2 In cases where post-weld heat treatment is required or specified, non-destructive inspections are to be performed after the heat treatment.

4.6.8 Measurement of Ferrite Content at Weld Surface

1 Measurement of ferrite content at the weld surface (including the weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.6**.

2 The ferrite content at the weld surface is to be measured prior to each test for the parts specified in **Fig. M4.13** in accordance with the requirements in **4.2.11-3** to **-5**.

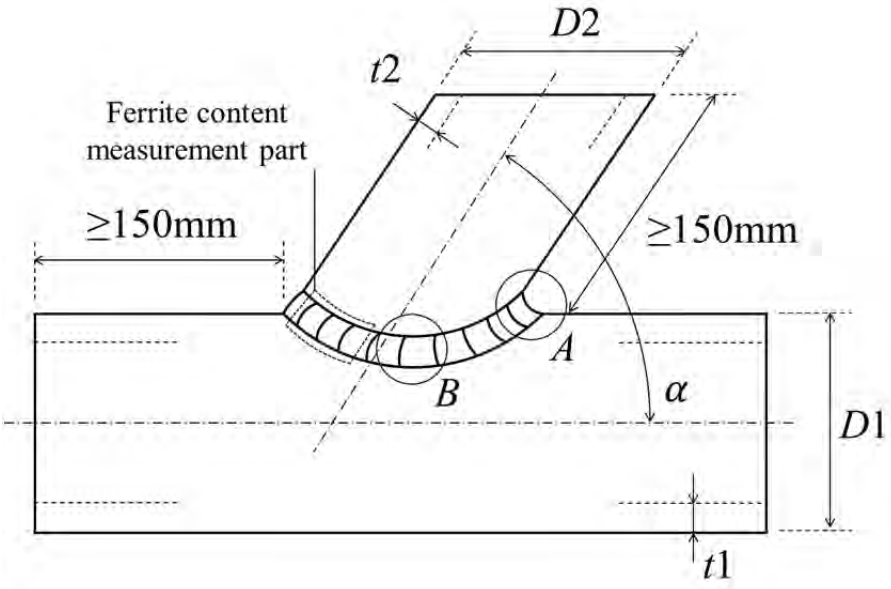
4.6.9 Retests

1 Where finished inspections, macro-structure inspections, non-destructive inspections (or fracture tests) fail, new test specimens welded under the same welding conditions are to be subject to retests, and all of these test specimens are to pass the test items specified.

2 Where hardness tests fail, retests may be carried out by correspondingly applying the requirements in **4.2.12-4**.

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

Fig. M4.13 Branch connection



Notes:

(1) The angle of a pipe (or tube) fitting in "α" degrees is the minimum value in the actual work.

(2) Measurement of ferrite content at the weld surface (including the weld metal and heat affected zone) is to be carried out in accordance with kind and grade of test assembly specified in **Table M4.6**.

(3) The part measured for ferrite content may be an arbitrary selected part of the weld.

(4) *D1* and *D2* may be different.

(5) *t1* and *t2* may be different.

(6) The distance between the outer circle of a pipe (or tube) and the end of another pipe (or tube) is not to be less than 150 *mm*.

(7) Macro-structure specimens are to be taken from parts *A* and *B*.

(8) Hardness tests may be carried out using macro-structure specimens taken from part *A*.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2020.

2. Notwithstanding the amendments to the Rules, the current requirements apply to welding procedures for which the application for approval is submitted to the Society before the effective date.

Amendment 1-2

Chapter 6 WELDING CONSUMABLES

6.7 Welding Consumables for Stainless Steel

6.7.4 General Provisions for Tests

Table M6.42 has been amended as follows.

Table M6.42 Kinds of Test of Welding Consumables for Stainless Steel (continued)

Kind of welding consumables		Kind of test	Test assembly					Kind and number of test specimens taken from test assembly
			Welding position	Dia. of electrode or wire[(1)] (*mm*)	No.	Dimension	Thickness (*mm*)	
Consumables for submerged arc welding	Multi-run technique	Deposited metal test	Flat	1.2 ~ 4.0	1	**Fig. M6.16**	19 ~ 25	Tensile test specimen: 1
		Butt weld test	Flat	1.2 ~ 4.0	1	**Fig. M6.18(a)**	19	Tensile test specimen: 1 Face bend test specimen: 1 Root bend test specimen: 1
	Two-run technique	Butt weld test	Flat	1.2 ~ 2.4	1	**Fig. M6.18(b)**	12	Tensile test specimen: 1 Face bend test specimen: 1 Root bend test specimen: 1
			Flat	4.0	1		19	Tensile test specimen: 1 Longitudinal tensile test specimen: 1 Face bend test specimen: 1 Root bend test specimen: 1
	Both multi-run and two-run techniques	Deposited metal test	Flat	1.2 ~ 4.0	1	**Fig. M6.16**	19 ~ 25	Tensile test specimen: 1
		Butt weld test (Multi-run)	Flat	1.2 ~ 4.0	1	**Fig. M6.18(a)**	19	Tensile test specimen: 1 Face bend test specimen: 1 Root bend test specimen: 1
		Butt weld test (Two-run)	Flat	1.2 ~ 2.4	1	**Fig. M6.18(b)**	12	Tensile test specimen: 1 Longitudinal tensile test specimen: 1 Face bend test specimen: 1 Root bend test specimen: 1
			Flat	4.0	1		19	Tensile test specimen: 1 Longitudinal tensile test specimen: 1 Face bend test specimen: 1 Root bend test specimen: 1

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 30 June 2020.

2. Notwithstanding the amendments to the Rules, the current requirements apply to welding consumables for which the application for approval is submitted to the Society before the effective date.

Amendment 1-3

Chapter 7 has been added as follows.

Chapter 7 Non-Destructive Testing Service Suppliers

7.1 General

7.1.1 Application

1 The requirements of this chapter are applied to firms providing *NDT* (Non-Destructive Testing) services for ships and offshore structures as well as their components.

2 The requirements of this chapter are intended to ensure that such firms are using appropriate procedures, have qualified and certified personnel and have implemented written procedures for the training, experience, education, examination, certification, performance, application, control, verification and reporting of *NDT*. In addition, firms are to furnish appropriate equipment and facilities commensurate with providing a professional service.

3 In case where such a firm requests approval, the Society may approve it as a *NDT* service supplier.

7.1.2 Definitions

The definitions of terms which appear in this chapter are specified in the following **Table M7.1**.

Table M7.1

NDT	Non-Destructive Testing. Comprising, but not limited to the methods and techniques *MT*, *PT*, *RT*, *RT-D*, *VT*, *UT*, *PAUT*, *TOFD*, *ET* and/or *ACFM*
Supplier	Independent *NDT* company or *NDT* department/section that forms a part of a company providing *NDT* services on ship and/or offshore components/structures.
MT	Magnetic Particle Testing
PT	Penetrant Testing
RT	Radiographic Testing
RT-D	Digital Radiography Testing (A technique within the method *RT*, e.g. Computed Radiography or Direct Radiography).
UT	Ultrasonic Testing
PAUT	Phased Array Ultrasonic Testing, (A type of *UT* technique in which electronically controls the transmission time of a pulse wave transmitted from a plurality transducer as ultrasonic beam at an arbitrary refraction angle and focal length to detect flaws. A device that can display and record flaw detection results as a two-dimensional image).
TOFD	Time of Flight Diffraction (A type of *UT* technique in which plane flaw detection and dimension measurement are performed by a method using the correlation between interference waves at various probe positions or angles of incidence).
ET	Electromagnetic Testing, Eddy Current Testing and/or Alternating Current Field Measurements (*ACFM*), etc.
VT	Visual Testing
Industrial sector	Section of industry or technology where specialized *NDT* practices are used, requiring specific product-related knowledge, skill, equipment and/or training.

7.1.3 References

The following referenced documents are to be used for the application of this chapter as appropriate. Other national standards listed below are accepted as compliant and hence are accepted for use together with this document. The below standards, in principle, refer to the most recent version published.

(1) ISO 9712:2012: Non-destructive testing – Qualification and certification of *NDT* personnel
(2) ISO/IEC 17020:2012: Conformity assessment – Requirements for the operation of various types of bodies performing inspection
(3) ISO/IEC 17024:2012: Conformity assessment – General requirements for bodies operating certification of persons
(4) ISO 9001:2015: Quality Management Systems – Requirements

7.2 Requirements for Documents

7.2.1 Requirements for Documents

1 Suppliers are to create and maintain documentation containing the following information.

(1) An outline of the supplier's organization and management structure, including any subsidiaries.
(2) Information on the structure of the supplier's quality management system.
(3) Quality manual and documented procedures covering the requirements given in **7.3**
(4) For companies with an in-house certification scheme for personnel, a written practice developed in accordance with a recognized standard or recommended practice (i.e. ASNT's SNT-TC-1A, 2016, ANSI/ASNT CP-189, 2016 or similar).
(5) Operational work procedures for each *NDT* method, including selection of the *NDT* technique.
(6) Training and follow-up programmes for *NDT* operators including practical training on various ship and offshore products.
(7) For suppliers who have personnel certification schemes, procedures related to the supervisor authorisation of *NDT* operators.
(8) Experience of the supplier in the specific service area.
(9) A list of documented training and experience for *NDT* operators within the relevant service area, including qualifications and third party certification per ISO 9712:2012 based certification schemes.
(10) Description of equipment used for the services performed by the suppliers.
(11) A guide for *NDT* operators to use equipment mentioned in **(10)**.
(12) Record formats.
(13) Information on other activities which may present a conflict of interest.
(14) Record of customer claims and corrective actions.
(15) Any current or past legal proceedings involving the company.

2 The documents mentioned in **1** are to be made available to the Society upon request.

7.3 Quality Requirements

7.3.1 Quality Management System

1 Suppliers are to have a documented quality management system, covering at least the following.

(1) Work procedures for all tasks and operations, including the various *NDT* methods and *NDT* techniques for which the supplier is involved.

(2) Preparation, issuance, maintenance and control of documents.
(3) Maintenance and calibration of the *NDT* equipment.
(4) Training programs for the *NDT* operators and the supervisors.
(5) Maintenance of records for *NDT* operators and supervisors training, qualification and certification.
(6) Certification of *NDT* operators (the latest version).
(7) Procedures for testing operator visual acuity.
(8) Supervision and verification of operation to ensure compliance with the *NDT* procedures.
(9) Quality management of subsidiaries.
(10) Job preparation.
(11) Order reference system where each engagement is traceable to when and where the test was carried out as well as who carried it out.
(12) Recording and reporting of information, including retention time of records.
(13) Code of conduct for the supplier's activities, especially *NDT* related activities.
(14) Periodic review of work process procedures.
(15) Corrective and preventive action.
(16) Feedback and continuous improvement.
(17) Internal audits.
(18) Provisions of accessibility to required codes, standards and procedures to assist *NDT* operators.

2 A documented quality system complying with the most recent version of ISO/IEC 17020:2012 and including the above information mentioned in **1** would be considered acceptable. The supplier may satisfy the requirements of Type A or Type B inspection body, as described in ISO/IEC 17020:2012.

7.3.2 Qualification and Certification of *NDT* Personnel

1 Supplier supervisors and operators are to be recognised by a certification scheme based upon ISO 9712:2012 or JIS Z2305. The aforementioned standards, in principle, refer to the most recent version published.

2 The supplier is to be responsible for the above **1**.

3 Personnel qualification by an employer based upon relevant and/or recommendation standards which are found acceptable by the Society (e.g. SNT-TC-1A, 2016 or ANSI/ASNT CP-189, 2016 etc.) may be accepted if the supplier's written practice is reviewed and found acceptable by the Society. In such cases, the supplier's written practice is at a minimum, except for the impartiality requirements of a certification body and/or authorised body, to comply with ISO 9712:2012.

4 Supervisor and operator certificates and competence are to comprise all industrial sectors and techniques being applied by the supplier.

7.3.3 Supervisor

1 Suppliers are to have a supervisor or supervisors who are responsible for the appropriate execution of *NDT* operations and for the professional standard of the operators and their equipment, including the professional administration of the working procedures.

2 Supervisors are to be independently certified to Level 3 by a third party based upon **7.3.2** and accepted by the Society.

3 In relation to **2**, suppliers are to employ, on a full-time basis, at least one supervisor for all *NDT* methods which are carried out by the supplier, except in cases where it is recognised that it is difficult for the supplier to directly employ a Level 3 certified supervisor for all the stated *NDT* methods.

4 Supervisors are to be directly involved in the review and acceptance of *NDT* procedures, *NDT*

reports and the calibration of *NDT* equipment and tools.

7.3.4 Operators

1 Operators are at a minimum to be qualified and certified to Level 2 in the *NDT* method(s) concerned and as described in **7.3.2**.

2 Operators who are qualified and certified as Level 1 are to only undertake the gathering of data and the using of *NDT* methods. They are not, however, to undertake the performing data interpretation or data analysis.

3 Operators are to have adequate knowledge of materials, welds, structures or components as well as of *NDT* equipment and its limitations that is sufficient to apply the relevant *NDT* method for each application appropriately.

7.3.5 Sub-contractors

1 Suppliers are to provide information on agreements and arrangements if any part(s) of the services provided are subcontracted.

2 Suppliers, in the following-up of subcontracts, are to give consideration to the quality management system of the subcontractor.

3 Subcontractors are to meet the same requirements placed upon suppliers for any *NDT* performed.

7.4 Equipment

7.4.1 Equipment

1 Suppliers are to maintain records of the *NDT* equipment used and detailed information related to maintenance, calibration and verification activities. Operators are to be familiar with the specific equipment type prior to using it.

2 Where the equipment is of unique nature, operators are to be trained by competent personnel in the operation and use of the equipment before carrying out *NDT* using such equipment.

3 Under all circumstances, suppliers are to possess sufficient equipment to carry out the services being a part of the *NDT* scope required by the Society.

7.5 Work instructions and procedures ets

7.5.1 Work instructions and procedures

1 Suppliers are to produce written procedures for the *NDT* being applied. These procedures are to be written, verified or approved by the supplier's Level 3 supervisor.

2 Procedures are to be documented and include all relevant information relating to the inspection, including the defect evaluation acceptance criteria deemed appropriate by the Society.

3 All *NDT* procedures and instructions are to be properly documented in such a way that the performed testing can be easily traced and/or repeated at a later stage.

4 All *NDT* procedures stipulated in **7.5.1** are to be reviewed by the Society.

7.6 Reporting

7.6.1 Reporting to the Society

1 All reports are to be properly documented in such a way that the performed testing and examination can be easily traced and/or repeated.

2 All reports are to identify the defects present in the tested area, and include a conclusive statement as to whether the material, weld, component or structure satisfies the acceptance criteria.

3 All reports are to include references to the applicable standards, *NDT* procedures and acceptance criteria applied with respect to the applicable *NDT* method/technique. In general, the acceptance criteria are to comply with relevant Society Rules.

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

1. The effective date of the amendments is 1 July 2020.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE

Part M Welding

2020 AMENDMENT NO.1

Notice No.26 30 June 2020

Resolved by Technical Committee on 22 January 2020

Notice No.26 30 June 2020
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

M2 WELDING WORKS

M2.1 General

Paragraph M2.1.1 has been amended as follows.

M2.1.1 Application

1 In **2.1.1-3, Part M of the Rules**, application of welding consumables used for rolled stainless steel ~~and~~, aluminium alloys, stainless steel pipes, steel tubes for boilers and heat exchangers, steel pipes for pressure piping, headers and steel pipes for low temperature service is to comply with the requirements specified in **-2** ~~and~~to **-~~3~~4** as follows.

2 (Omitted)

3 (Omitted)

4 Stainless steel pipes, steel tubes for boilers and heat exchangers, steel pipes for pressure piping, headers and steel pipes for low temperature service

The welding consumables corresponding to the kind of steel pipes (of tubes) or headers are, in principle, to be selected in accordance with **Table M2.1.1-1** or **Table M2.1.1-3**. Other considerations for selecting welding consumables may be acceptable in cases where technical documents clarifying the suitability of the selection are submitted and deemed to be appropriate by the Society.

Table M2.1.1-1 has been amended as follows.

Table M2.1.1-1 Application of Welding Consumables
(Rolled Stainless Steel and Stainless Steel Pipes)

Kind and grade of base plates		Grade of applicable welding consumables			
Rolled Stainless Steel	Stainless Steel Pipe				
*KSUS*304	*K*304*TP*	*KD*308	*KY*308	*KW*308	*KU*308
		*KD*308*L*(1)	*KY*308*L*(1)	*KW*308*L*(1)	*KU*308*L*(1)
*KSUS*304*L*	*K*304*LTP*	*KD*308*L*	*KY*308*L*	*KW*308*L*	*KU*308*L*
*KSUS*304*N1*	-	*KD*308*N*2	*KY*308*N*2	*KW*308*N*2	-
*KSUS*304*N2*	-	*KD*308*N*2	*KY*308*N*2	*KW*308*N*2	-
*KSUS*304*LN*	-	*KD*308*L*(1)	*KY*308*L*(1)	*KW*308*L*(1)	*KU*308*L*(1)
*KSUS*309*S*	*K*309*STP*	*KD*309	*KY*309	*KW*309	*KU*309
		*KD*309*L*(1)	*KY*309*L*(1)	*KW*309*L*(1)	*KU*309*L*(1)
*KSUS*310*S*	*K*310*STP*	*KD*310	*KY*310	*KW*310	*KU*310
		-	*KY*310*S*	-	-
*KSUS*316	*K*316*TP*	*KD*316	*KY*316	*KW*316	*KU*316
		*KD*316*L*(1)	*KY*316*L*(1)	*KW*316*L*(1)	*KU*316*L*(1)
*KSUS*316*L*	*K*316*LTP*	*KD*316*L*	*KY*316*L*	*KW*316*L*	*KU*316*L*
*KSUS*316*N*	-	*KD*316	*KY*316	*KW*316	*KU*316
*KSUS*316*LN*	-	*KD*316*L*(1)	*KY*316*L*(1)	*KW*316*L*(1)	*KU*316*L*(1)
*KSUS*317	*K*317*TP*	*KD*317	*KY*317	*KW*317	*KU*317
		*KD*317*L*(1)	*KY*317*L*(1)	*KW*317*L*(1)	*KU*317*L*(1)
*KSUS*317*L*	*K*317*LTP*	*KD*317*L*	*KY*317*L*	*KW*317*L*	*KU*317*L*
*KSUS*317*LN*	-	*KD*317*L*(1)	*KY*317*L*(1)	*KW*317*L*(1)	*KU*317*L*(1)
*KSUS*321	*K*321*TP*	-	*KY*321	-	-
		*KD*347	*KY*347	*KW*347	*KU*347
*KSUS*323*L*	-	*KD*2209	*KY*2209	*KW*2209	-
*KSUS*329*J*1	*K*329*J*1*TP*	*KD*329*J*1	-	-	-
*KSUS*329*J*3*L*	*K*329*J*3*LTP*	*KD*2209	*KY*2209	*KW*2209	-
*KSUS*329*J*4*L*	*K*329*J*4*LTP*	*KD*329*J*4*L*	*KY*329*J*4*L*	*KW*329*J*4*L*	-
*KSUS*347	*K*347 *TP*	*KD*347	*KY*347	*KW*347	*KU*347
*KSUS*821*L*1	-	*KD*2209	*KY*2209	*KW*2209	-

Note:

(1) The specified minimum proof stress and tensile strength of the applicable welding consumables are equivalent to or greater than those of the base plate steels are to be used.

Table M2.1.1-3 has been added as follows.

Table M2.1.1-3　Application of Welding Consumables
(Steel tubes for boiler and heat exchangers, steel pipes for pressure piping, headers and steel pipes for low temperature service)

Kind of base pipe (or tube)	Grade of base pipe (or tube)	Grade of applicable welding consumables (1)
Steel tubes for boilers and heat exchangers, steel pipes for pressure piping, headers	*KSTB*33, *KSTB*35, *KSTPG*38, *KSTS*38, *KSTPT*38	1, 2, 3, 51, 52, 53, 54, 52*Y*40, 53*Y*40, 54*Y*40, *L*1, *L*2, *L*3
	*KSTB*42, *KSTPG*42, *KSTS*42, *KSTPT*42, *KBH*-1	51, 52, 53, 54, 52*Y*40, 53*Y*40, 54*Y*40, *L*2, *L*3, 2*Y*42, 3*Y*42, 4*Y*42, 5*Y*42
	*KSTS*49, *KSTPT*49, *KBH*-2	51, 52, 53, 54, 52*Y*40, 53*Y*40, 54*Y*40, *L*3, 2*Y*42, 3*Y*42, 4*Y*42, 5*Y*42
Steel pipes for low temperature service	*KLPA*	*L*1, *L*2, *L*3, 54, 54*Y*40
	KLPB, *KLPC*	*L*2, *L*3
	*KLP*9	*L*91, *L*92

Note:
The symbols for the welding consumables listed above indicate materials which are specified in **Table M6.1**, **Table M6.12**, **Table M6.21**, **Table M6.29** or **Table M6.58** that have the same mark at the end. (For example, "3" indicates *KMW*3, *KAW*3, *KSW*3 and *KEW*3; "*L*3" indicates *KMWL3*, *KAWL*3 and *KSWL3*; and "3*Y42*" indicates *KMW*3*Y*42, *KAW*3*Y*42 and *KSW*3*Y*42.)

M4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

M4.1 General

Paragraph M4.1.4 has been amended as follows.

M4.1.4 Range of Approval

1 (Omitted)

Table M4.1.4-1 Range of Approval for Rolled Steel for the Large Heat Input Welding
(Table and Note are omitted.)

2 With respect to the provisions of **4.1.4-1(1)** and **-2(1), Part M of the Rules**, fillet weld joints, T-joints with full penetration and T-joints with partial penetration welding positions included in the approval of butt welding are to be in accordance with the following.

(1) For plates, **Table M4.1.4-2** and **Table M5.10, Part M of the Rules**

(2) For pipes, **Table M4.1.4-3** and **Table M5.11, Part M of the Rules**

Table M4.1.4-2 Correspondence of Fillet weld joints, T-joints with Full Penetration and T-joints with Partial Penetration Welding Positions to Butt Welding Positions for Plates

~~Position of b~~Butt welding position (welding position during tests)	Fillet weld joints, T-joints with full penetration and T-joints with partial penetration welding positions deemed to be included in butt welding positions
Flat (*PA*)	Flat (*PA*)
	Horizontal-vertical (*PB*)
Horizontal (*PC*)	Horizontal (*PC*)
	Horizontal-vertical (*PB*)
Vertical upward (*PF*)	Vertical upward (*PF*)
Vertical downward (*PG*)	Vertical downward (*PG*)
Overhead (*PE*)	Horizontal overhead (*PD*)
	Overhead (*PE*)

Table M4.1.4-3 Correspondence of Fillet weld joints and T-joints with Full Penetration Welding Positions to Butt Welding Positions for Pipes

Butt welding position (welding position during tests)	Fillet weld joints and T-joints with full penetration welding positions deemed to be included in butt welding positions
Flat (*PA*)	Flat (*PA*)
	Horizontal vertical (*PB*)
Horizontal (*PC*)	Horizontal vertical (*PB*)
Tube position for welding upwards (*PH*)	Tube position for welding upwards (*PH*)
Tube position for welding downwards (*PJ*)	Tube position for welding downwards (*PJ*)

3 The wording "Set-on, Set-in and Set-through" specified in **4.1.4-2(1), Part M of the Rules** means the following **(1)** to **(3)**.

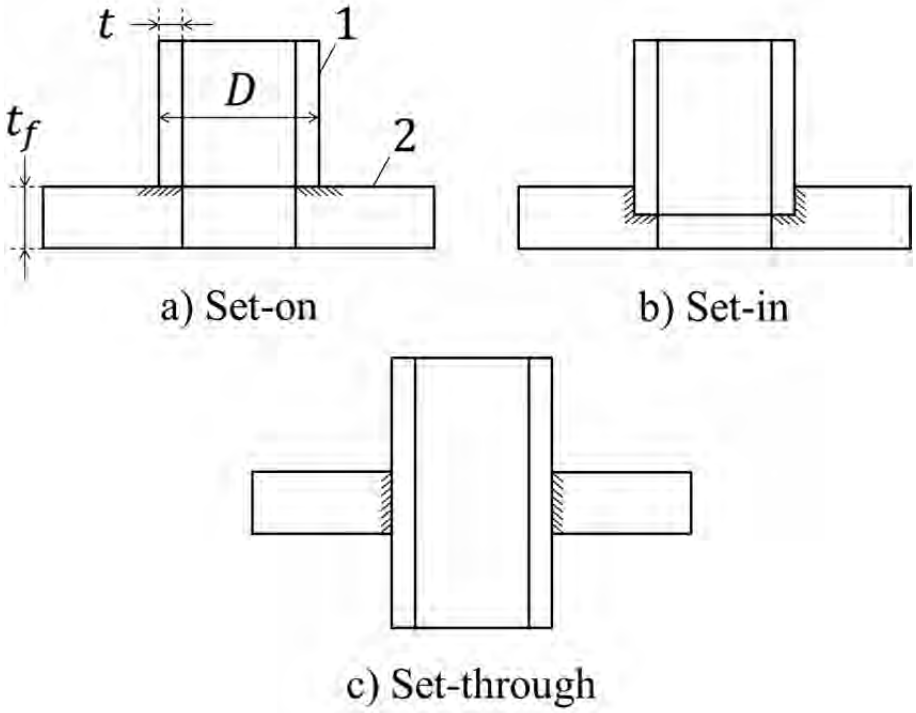
(1) Set-on means a shape in which the end of the pipe is abutted against the surface of the flange (or main pipe)(**Fig. M4.1.4-1 a)**).

(2) Set-in means a shape in which a pipe is inserted into a socket wthin the flange (or main pipe) (**Fig. M4.1.4-1 b)**).

(3) Set-through means a shape in which a pipe penetrates a hole in the flange (or main pipe) (**Fig. M4.1.4-1 c)**).

Fig. M4.1.4-1 has been added as follows.

Fig. M4.1.4-1 Kinds of pipe assemblies



Notes:

(1) *1* is the pipe (or tube), *2* is the flange (or the main pipe (or tube))

(2) *D* is outside diameter of the pipe (or tube)

(3) *t* is thickness of the pipe (or tube)

(4) t_f is thickness of the flange(or the main pipe (or tube))

~~3~~**4** The wording "deemed appropriate by the Society" specified in **4.1.4-3, Part M of the Rules** means the following **(1)** to **(3)**.

((1) to (3) are omitted.)

~~4~~**5** For the wording "deemed appropriate by the Society" specified in **4.1.4-5, 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) to (3) are omitted.)

(Table M4.1.4-4 to M4.1.4-8 are omitted.)

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 30 June 2020.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to welding procedures for which the application for approval is submitted to the Society before the effective date.