RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part M Welding

2008 AMENDMENT NO.1

Rule No.19 15th April 2009

Resolved by Technical Committee on 4th February 2009

Approved by Board of Directors on 24th February 2009

Rule No.19 15th April 2009
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 2 WELDING WORKS

2.4 Welding Process

Paragraph 2.4.1 has been amended as follows.

2.4.1 Selection of Welding Consumables

1 The welding consumables used for rolled steels for hull, rolled steels for low temperature service and high strength quenched and tempered rolled steel plates for structures are to be selected in accordance with the requirements provided below.

(1) The selection of welding consumables is to be in accordance with the requirements provided in **Table M2.1**.

(2) For the requirement specified in preceding **(1)**, welded joints of different grades of steel may be used as the followings.
   (a) Welding consumables for lower grade of steel may be used for welded joints of different grades of steel of the same specified strength.
   (b) Welding consumables required for the steel of lower specified strength may be used for welded joints of different specified strength, provided that the adequate measures to prevent cracks are taken.
   (c) Low hydrogen electrodes are to be used for the welding of the high tensile steels or for the welding of the high tensile steel and mild steel. Where the high tensile steels with thermo-mechanical control process are used as base metal, non-low hydrogen electrodes may be used as the welding consumables provided that it is deemed to be appropriate by the Society.

2 With respect to materials approved by the Society for use in welding consumables, materials other than approved materials may be used for backing. However, for the backing in welding consumables specified in **6.5**, other approved welding consumables are to be used.

Table M2.1 has been amended as follows.

Table M2.1 Selection of Welding Consumables (rolled steel plate)

Kind and Grade of steel to be welded		Grade of applicable welding consumables [1]
Rolled Steel for Hull	*KA*	1, 2, 3, 51, 52, 53, 54, 52*Y*40, 53*Y*40, 54*Y*40, *L*1, *L*2, *L*3
	KB,*KD*	2, 3, 52, 53, 54, 52*Y*40, 53*Y*40, 54*Y*40, *L*1, *L*2, *L*3
	KE	3, 53, 54, 53*Y*40, 54*Y*40, *L*1, *L*2, *L*3
	*KA*32, *KA*36	51, 52, 53, 54, 52*Y*40, 53*Y*40, 54*Y*40, *L*2[2], *L*3, 2*Y*42, 3*Y*42, 4*Y*42, 5*Y*42
	*KD*32, *KD*36	52, 53, 54, 52*Y*40, 53*Y*40, 54*Y*40, *L*2[2], *L*3, 2*Y*42, 3*Y*42, 4*Y*42, 5*Y*42
	*KE*32, *KE*36	53, 54, 53*Y*40, 54*Y*40, *L*2[2], *L*3, 2*Y*42, 3*Y*42, 4*Y*42, 5*Y*42
	*KF*32, *KF*36	54, 54*Y*40, *L*2[2], *L*3, 4*Y*42, 5*Y*42
	*KA*40, *KD*40	52*Y*40, 53*Y*40, 54*Y*40, 3*Y*42, 4*Y*42, 5*Y*42, 2*Y*46, 3*Y*46, 4*Y*46, 5*Y*46
	*KE*40	53*Y*40, 54*Y*40, 3*Y*42, 4*Y*42, 5*Y*42, 3*Y*46, 4*Y*46, 5*Y*46
	*KF*40	54*Y*40, 4*Y*42, 5*Y*42, 4*Y*46, 5*Y*46
Rolled Steel for Low Temperature Service	*KL*24*A*	*L*1, *L*2, *L*3, 54, 54*Y*40
	*KL*24*B*, *KL*27, *KL*33	*L*2, *L*3, 5*Y*42[3]
	*KL*37	*L*3, 5*Y*42
	*KL*9*N*53, *KL*9*N*60	*L*91, *L*92
High Strength Quenched and Tempered rolled Steel plates for Structures	*KA*~~43~~420	2*Y*42, 3*Y*42, 4*Y*42, 5*Y*42, 2*Y*46, 3*Y*46, 4*Y*46, 5*Y*46, 2*Y*50, 3*Y*50, 4*Y*50, 5*Y*50
	KD~~43~~420	3*Y*42,4*Y*42, 5*Y*42, 3*Y*46, 4*Y*46, 5*Y*46, 3*Y*50, 4*Y*50, 5*Y*50
	KE~~43~~420	4*Y*42, 5*Y*42, 4*Y*46, 5*Y*46, 4*Y*50, 5*Y*50
	KF~~43~~420	5*Y*42, 5*Y*46, 5*Y*50
	KA~~47~~460	2*Y*46, 3*Y*46, 4*Y*46, 5*Y*46, 2*Y*50, 3*Y*50, 4*Y*50, 5*Y*50
	KD~~47~~460	3*Y*46, 4*Y*46, 5*Y*46, 3*Y*50, 4*Y*50, 5*Y*50
	KE~~47~~460	4*Y*46, 5*Y*46, 4*Y*50, 5*Y*50
	KF~~47~~460	5*Y*46, 5*Y*50
	KA~~51~~500	2*Y*50, 3*Y*50, 4*Y*50, 5*Y*50, 2*Y*55, 3*Y*55, 4*Y*55, 5*Y*55
	KD~~51~~500	3*Y*50, 4*Y*50, 5*Y*50, 3*Y*55, 4*Y*55, 5*Y*55
	KE~~51~~500	4*Y*50, 5*Y*50, 4*Y*55, 5*Y*55
	KF~~51~~500	5*Y*50, 5*Y*55
	KA~~56~~550	2*Y*55, 3*Y*55, 4*Y*55, 5*Y*55, 2*Y*62, 3*Y*62, 4*Y*62, 5*Y*62
	KD~~56~~550	3*Y*55, 4*Y*55, 5*Y*55, 3*Y*62, 4*Y*62, 5*Y*62
	KE~~56~~550	4*Y*55, 5*Y*55, 4*Y*62, 5*Y*62
	KF~~56~~550	5*Y*55, 5*Y*62
	KA~~63~~620	2*Y*62, 3*Y*62, 4*Y*62, 5*Y*62, 2*Y*69, 3*Y*69, 4*Y*69, 5*Y*69
	KD~~63~~620	3*Y*62, 4*Y*62, 5*Y*62, 3*Y*69, 4*Y*69, 5*Y*69
	KE~~63~~620	4*Y*62, 5*Y*62, 4*Y*69, 5*Y*69
	KF~~63~~620	5*Y*62, 5*Y*69
	KA~~70~~690	2*Y*69, 3*Y*69, 4*Y*69, 5*Y*69
	KD~~70~~690	3*Y*69, 4*Y*69, 5*Y*69
	KE~~70~~690	4*Y*69, 5*Y*69
	KF~~70~~690	5*Y*69

Notes :

(1) The symbols of welding consumables listed above show the materials which are specified in **Table M6.1**, **Table M6.12**, **Table M6.21**, **Table M6.29** and **Table M6.58**, and have same mark at the end. (For example, "3" shows *KMW*3, *KAW*3, *KSW*3 and *KEW*3, "*L*3" shows *KMWL*3, *KAWL*3 and *KSWL*3, "3 *Y*42" shows *KMW*3 *Y*42, *KAW*3 *Y*42 and *KSW*3 *Y*42.)

(2) Welding consumables of "*L*2" is applicable to steel grade of *KA*32, *KD*32, *KE*32 or *KF*32 only.

(3) Welding consumables of "5*Y*42" is applicable to steel grade of *KL*33 only.

Chapter 4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

4.1 General

4.1.4 Range of Approval

Sub-paragraph 4.1.4-1 has been amended as follows.

1 The scope of approval of the welding procedure and related specifications of rolled steels for hull and quenched and tempered high tensile rolled steel for structure are in accordance with the following **(1)** through **(5)**, on the condition that other welding conditions are same. However, the range of approval differing from the requirements specified in this Chapter may be accepted that it is deemed appropriate by the Society.

(1) Kind of weld joints
Kind of weld joints is in accordance with in **Table M4.1**. Where the welding procedures for butt welding are approval, the kinds of weld joints include the fillet weld joints, corresponding to the welding position applied for the butt weld joint.

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

(3) Leg length of fillet welding
The range of the leg length of fillet welding is in accordance with in **Table M4.3**.

(4) Kinds of base metal
   (a) Rolled steels for hull
      i) Within the same strength level, the welding procedures are considered applicable to lower toughness grade (material with higher specified impact test temperature).
      ii) In addition to the requirement in **i)**, within the same and below toughness grades, the welding procedures are considered applicable to the one and two lower strength levels (material with the one and two lower specified yield strength).
   (b) Quenched and tempered high tensile rolled steel for structure
      i) Within the same strength level, the welding procedures are considered applicable to lower toughness grade.
      ii) In addition to the requirement in **i)**, within the same and below toughness grades, the welding procedures are considered applicable to the one lower strength levels.
   (c) Notwithstanding the requirement given in **(a)** and **(b)**, for the large heat input welding specified in **Note (5) of Table M4.2**, the welding procedures are considered applicable to that toughness grade tested and one strength level below.

(5) Kinds of welding consumables
The welding consumables are to be not bland but grade (including all suffixes), except the large heat input specified **Note (5) of Table M4.2**.

(6) Welding position
   (a) Welding position is in accordance with in **Fig. M5.1**.
   (b) Approval tests are to be performed each welding position. However, to quality 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 vertical position with travel in the downward direction which will always require separate tests and only are acceptable for that position.

4.2 Tests for Butt Welded Joints

4.2.3 Test Assemblies

Sub-paragraph 4.2.3-3 has been amended as follows.

1 Test assemblies are to be prepared with the same or equivalent material as used in the actual work.
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 Test assemblies are to be welded in ~~the same welding positions as the actual work~~ the general conditions specified in welding procedure specifications.
4 Test assemblies for pipes over 300*mm* in diameter at the actual work may be those for the plates.
5 For butt welded joints of rolled steel plates for low temperature service and quenched and tempered high tensile rolled steels for structure, the test assemblies are to be generally so prepared that the rolling direction is parallel to the direction of welding.
6 In general, the thickness of test assemblies for welding procedure qualification test is to be equal to the thickness of the thickest material to be adopted in the actual work.
7 The tack welds of test piece are to be the same procedure as actual work.

Table M4.4 has been amended as follows.

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 [2]	Macro-Structure inspection	Hardness test	Non-destructive inspection [3]
Rolled steel for hull	*KA*, *KB*, *KD*, *KE* *KA*32, *KD*32, *KE*32, *KF*32, *KA*36, *KD*36, *KE*36, *KF*36, *KA*40, *KD*40, *KE*40, *KF*40		Whole length of welding joints	2	4[5]	3～8<*a,b,c,d,e*>[7]	1	1[10]	Whole length of welding joints
Rolled steels for lower temperature service	*KL*24*A*, *KL*24*B*, *KL*27, *KL*33, *KL*37, *KL2N*30, *KL*3*N*32, *KL*5*N*43					5 <*A,B,C,D,E*>[8]		—	
	*KL*9*N*53, *KL*9*N*60			4[4]	2[6]				
Steel pipes for low temperature service	*KLPA*, *KLPB*, *KLPC*, *KLP*2, *KLP*3, *KLP*9			2	4				
Quenched and tempered high tensile rolled steel for structure	*KA*~~43~~420, *KD*~~43~~420, *KE*~~43~~420, *KF*~~43~~420, *KA*~~47~~460, *KD*~~47~~460, *KE*~~47~~460, *KF*~~47~~460, *KA*~~51~~500, *KD*~~51~~500, *KE*~~51~~500, *KF*~~51~~500, *KA*~~56~~550, *KD*~~56~~550, *KE*~~56~~550, *KF*~~56~~550, *KA*~~63~~620, *KD*~~63~~620, *KE*~~63~~620, *KF*~~63~~620, *KA*~~70~~690, *KD*~~70~~690, *KE*~~70~~690, *KF*~~70~~690				4[5]	3～8<*a,b,c,d,e*>[7]	1	1	
Rolled stainless steels	*KSUS*304, *KSUS*304*L*, *KSUS*304*N*1, *KSUS*304*N*2, *KSUS*304*LN*, *KSUS*309*S*, *KSUS*310*S*, *KSUS*316, *KSUS*316*L*, *KSUS*316*N*, *KSUS*316*LN*, *KSUS*317, *KSUS*317*L*, *KSUS*317*LN*, *KSUS*321, *KSUS*347					[9]		—	
Stainless steel pipes	*K*304*TP*, *K*304*LTP*, *K*309*STP*, *K*310*STP*, *K*316*TP*, *K*316*LTP*, *K*317*TP*, *K*317*LTP*, *K*321*TP*, *K*347*TP*				4				
Aluminium alloys [11]	5000 Series	5754*P*, 5086*P*, 5086*S*[12] , 5083*P*, 5083*S*[12]				—			
	6000 Series	6005*AS*[13], , 6061*P*, 6061*S*[13] , 6082*S*[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)**).

(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 *KA*36, *KD*36, *KE*36, *KF*36, *KA*40, *KD*40, *KE*40 and *KF*40, the tests are to be carried out.

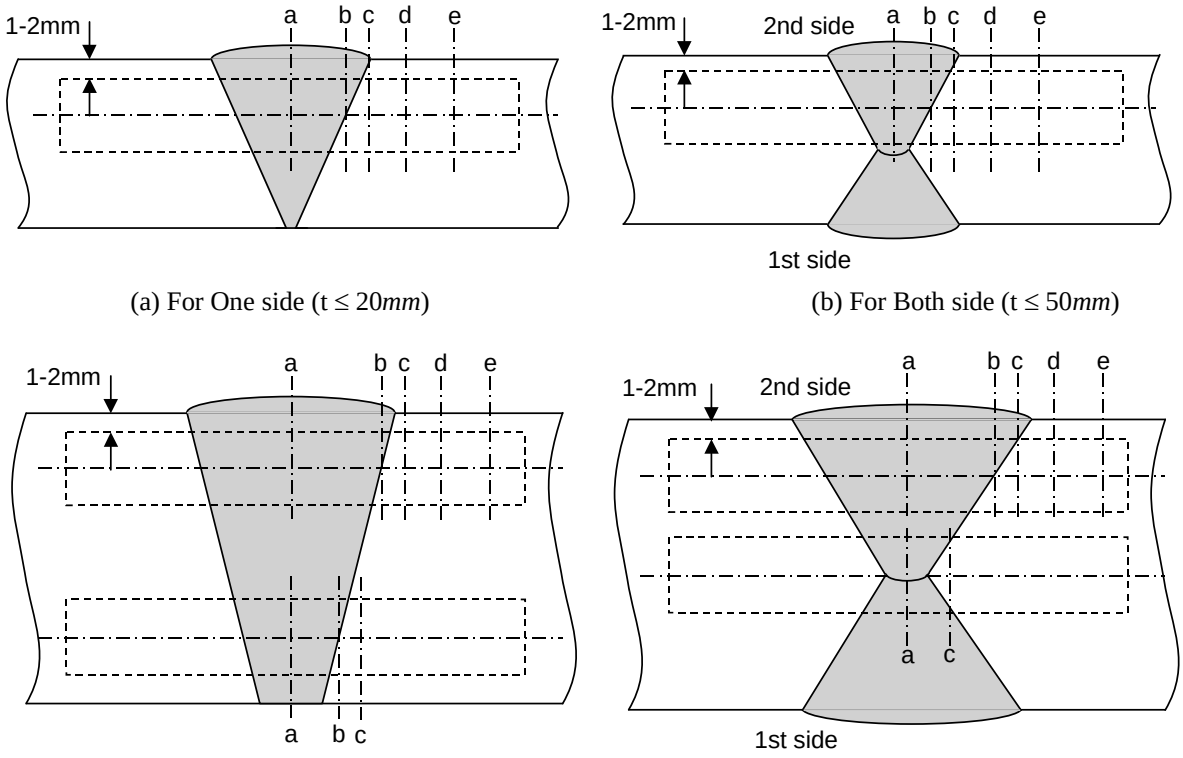
(11) All temper conditions indicated with grades are to be included (See **Table K8.3**).

(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.

Fig M4.3 has been amended as follows.

Fig M4.3 Position of Notch for Impact Test Specimen for rolled steels for hull and quenched and tempered high tensile rolled steel for structure (Where welding heat input is greater than 50*kJ/cm*, Unit: *mm*)



(a) For One side (t ≤ 20*mm*)

(b) For Both side (t ≤ 50*mm*)

(c) For One side (t > 20*mm*)

(d) For Both side (t > 50*mm*)

Notch location:

a: Center of weld "WM"

b: On fusion line "FL"

c: In HAZ, 2*mm* from fusion line

d: In HAZ, 5*mm* from fusion line

e: In HAZ, 10*mm* from fusion line <u>in case of heat input > 200*kJ/cm*</u>

Table M4.6 has been amended as follows.

Table M4.6 Bend Test Requirements for Butt Welded Joint

Kind of test assembly	Grade of test assembly	Radius of plunger (*mm*)[(1)]	Bending angle (*degree*)
Steel pipes for low temperature service	*KLP*9	$\frac{10}{3}t$	180
High strength quenched and tempered rolled steel plates for structure	*KA*~~43~~420, *KD*~~43~~420, *KE*~~43~~420, *KF*~~43~~420 *KA*~~47~~460, *KD*~~47~~460, *KE*~~47~~460, *KF*~~47~~460 *KA*~~51~~500, *KD*~~51~~500, *KE*~~51~~500, *KF*~~51~~500	$\frac{5}{2}t$	
	KA~~56~~550, *KD*~~56~~550, *KE*~~56~~550, *KF*~~56~~550 *KA*~~63~~620, *KD*~~63~~620, *KE*~~63~~620, *KF*~~63~~620 *KA*~~70~~690, *KD*~~70~~690, *KE*~~70~~690, *KF*~~70~~690	3*t*	
Aluminium alloys [(2)]	5754*P*	$\frac{3}{2}t$	
	5086*P*, 5086*S* [(3)] 5083*P*, 5083*S* [(3)]	3*t*	
	6005*AS* [(4)] 6061*P*, 6061*S* [(4)] 6082*S* [(4)]	$\frac{7}{2}t$	
Other materials		2*t*	

Notes:

(1) *t*: thickness of the test specimen (*mm*)

(2) See **Notes (11)** of **Table M4.4**.

(3) See **Notes (12)** of **Table M4.4**.

(4) See **Notes (13)** of **Table M4.4**.

Table M4.9 has been amended as follows.

Table M4.9 Impact Test Requirements for Butt Weld Joint (Quenched and Tempered High Tensile Rolled Steels for Marine Construction)

Grade of steel	Testing temperature (℃)	Minimum mean absorbed energy (J)[1]		
		a[2]	b, c, d, e[2]	
			L[3]	T[3]
KA~~43~~420	0	47	42	28
KD~~43~~420	-20			
KE~~43~~420	-40			
KF~~43~~420	-60			
KA~~47~~460	0		46	31
KD~~47~~460	-20			
KE~~47~~460	-40			
KF~~47~~460	-60			
KA~~51~~500	0	50	50	33
KD~~51~~500	-20			
KE~~51~~500	-40			
KF~~51~~500	-60			
KA~~56~~550	0	55	55	37
KD~~56~~550	-20			
KE~~56~~550	-40			
KF~~56~~550	-60			
KA~~63~~620	0	62	62	41
KD~~63~~620	-20			
KE~~63~~620	-40			
KF~~63~~620	-60			
KA~~70~~690	0	69	69	46
KD~~70~~690	-20			
KE~~70~~690	-40			
KF~~70~~690	-60			

Notes:

(1) A set of test specimens is considered to have failed if the value of absorbed energy of more than two test specimens is less than the specified value of minimum mean absorbed energy or if the value of any one of the test specimens is less than 70% of the specified value of minimum mean absorbed energy.

(2) Position of notch as shown in **Fig M4.2** and **Fig M4.3**.

(3) *L* (or *T*) indicates that the direction of welding is transverse (or parallel) to the rolling.

4.3 Tests for Fillet Weld Joints

4.3.3 Test Assemblies and Welding

Sub-paragraph 4.3.3-3 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 assembl~~y~~ies ~~is~~ are to be welded in ~~the same welding position as the actual work~~ 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 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.

Chapter 6 WELDING CONSUMABLES

Table M6.59 has been amended as follows.

Table M6.59 Grades of Steel for Test Assembly

Grades of welding consumables	Grade of steel for test assembly(1)
KMW2Y42 ～ 69 *KSW2Y42* ～ 69 *KAW2Y42* ～ 69	*KA~~43~~420*～*KA~~70~~690*
KMW3Y42 ～ 69 *KSW3Y42* ～ 69 *KAW3Y42* ～ 69	*KA~~43~~420*～*KA~~70~~690* or *KD~~43~~420*～*KD~~70~~690
KMW4Y42 ～ 69 *KSW4Y42* ～ 69 *KAW4Y42* ～ 69	*KA~~43~~420* ～ *KA~~70~~690*, *KD~~43~~420* ～ *KD~~70~~690* or *KE~~43~~420* ～ *KE~~70~~690*
KMW5Y42 ～ 69 *KSW5Y42* ～ 69 *KAW5Y42* ～ 69	*KA~~43~~420*～*KA~~70~~690*, *KD~~43~~420*～*KD~~70~~690*, *KE~~43~~420*～*KE~~70~~690* or *KF~~43~~420*～*KF~~70~~690*

Note:

(1) Notwithstanding the requirements in this table, mild or high tensile steels may be used for deposited metal test assembly. In this case, appropriate buttering is to be carried out.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 15 April 2009.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE

Part M Welding

2009 AMENDMENT NO.1

Notice No.18 15th April 2009

Resolved by Technical Committee on 4th February 2009

Notice No.18 15th April 2009
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

M6 WELDING CONSUMABLES

M6.1 General

Paragraph M6.1.3 has been amended as follows.

M6.1.3 Approval

1 The wording "brand" in **6.1.3-1, Part M of the Rules** includes the combination consisting of electrode numbers, flux, filler and backing etc. in addition to welding consumables (filler rod, filler wire) in general.

2 The treatment of **6.1.3-8, Part M of the Rules** is to be in accordance with **Table M6.1.3-1**.

Table M6.1.3-1 Correspondence of the Fillet Welding Positions with the Butt Welding Positions

Positions of butt welding	Fillet welding position deemed to be included in butt welding position
Flat in butt welding	Flat in fillet welding
	Horizontal-vertical in fillet welding
Horizontal in butt welding	Horizontal in fillet welding
	Horizontal-vertical in fillet welding
Vertical upward in butt welding	Vertical upward in fillet welding
Vertical downward in butt welding	Vertical downward in fillet welding
Overhead in butt welding	Overhead in fillet welding

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 15 April 2009.