RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part M Welding

2010 AMENDMENT NO.1

Rule No.24 15th April 2010

Resolved by Technical Committee on 5th February 2010

Approved by Board of Directors on 23rd February 2010

Rule No.24 15th April 2010
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

4.2 Tests for Butt Welded Joints

4.2.7 Impact Tests

Sub-paragraph -7 has been added as follows.

7 In cases where maximum thickness to be approved is more than 50*mm* but not exceeding 70*mm*, brittle fracture tests may be required in addition to impact tests; in cases where such maximum thickness to be approved exceeds 70*mm*, brittle fracture tests are to be carried out in addition to impact tests or technical documents related to such brittle fracture tests are to be submitted to the Society. Also, brittle fracture tests described above are to be carried out at the maximum thickness to be approved.

Table M4.7 has been amended as follows.

Table M4.7 Impact Test Requirements for Butt Weld Joint (Rolled Steel for Hull, where thickness of test assemblies is not greater than 50*mm*)[(1)]

Grade of steel	Testing temperature (℃)	Value of minimum average absorbed energy (*J*) [(2)]		
		For manually or semi-automatically weld joints		For automatically welded joints
		Downhand, Horizontal, Overhead	Vertical upward, Vertical downward	
KA[(3)]	20	47	34	34
KB[(3)], *KD*	0			
KE	-20			
*KA*32, *KA*36	20			
*KD*32, *KD*36	0			
*KE*32, *KE*36	-20			
*KF*32, *KF*36	-40			
*KA*40	20		39	39
*KD*40	0			
*KE*40	-20			
*KF*40	-40			

Notes:

(1) ~~For~~ In cases where the thickness of test assemblies exceeds ~~above~~ 50*mm*, impact test requirements ~~are to be in accordance with **4.1.3-3** and to be agreed~~ deemed appropriate by the Society are to be applied.

(2) 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 anyone of the test specimens is less than 70% of the specified value of minimum mean absorbed energy.

(3) Steels average absorbed energy on fusion line and in heat affected zone is to be minimum 27*J*.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 15 April 2010.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to welding procedure other than those for which the application for approval is submitted to the Society on or after the effective date.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part M Welding

GUIDANCE

2010 AMENDMENT NO.1

Notice No.42 15th April 2010

Resolved by Technical Committee on 5th February 2010

Notice No.42 15th April 2010
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

Amendment 1-1

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 Application of provisory requirement specified in **4.1.4-1**, **Part M** of the Rules is to be applied to **4.1.4-1(4)(c)**, **Part M** of the Rules and to be in accordance with **Table 4.1.4-1**. In this case, test records which the Surveyor deems appropriate are to be submitted to the Surveyor.

Table M4.1.4-1 Grades

Grade of test assembly(1)	Approval range of grade
KA	*KA*
KB	*KA*, *KB*
KD	*KA*, *KB*, *KD*
*KA*32	*KA*, *KA*32
*KD*32	*KA*, *KB*, *KD*, *KA*32, *KD*32
*KA*36	*KA*, *KA*32, *KA*36
*KD*36	*KA*, *KB*, *KD*, *KA*32, *KD*32, *KA*36, *KD*36
*KA*40	*KA*32, *KA*,36, *KA*40
*KD*40	*KA*32, *KD*32, *KA*36, *KD*36, *KA*40, *KD*40

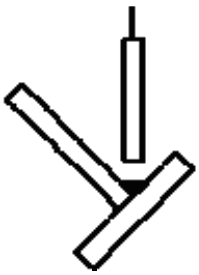
Note:
(1) For thickness above 50 *mm*, this Table is not applicable.

2 With respect to the provisions of **4.1.4-1(1)**, **Part M** of the Rules, the fillet welding included in the approval of the butt welding is to be in accordance with **Table M4.1.4-2** and **Fig. M4.1.4**

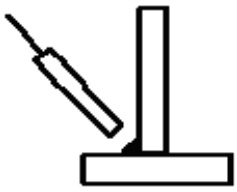
Table M4.1.4-2 Correspondence of the Fillet Welding Positions with the Butt Welding Positions

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

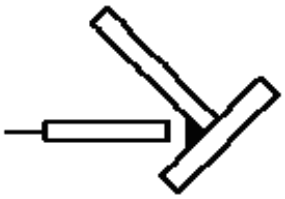
Fig. M4.1.4 Fillet welding position



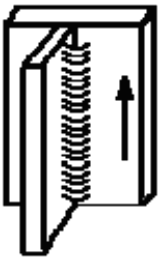
Flat in fillet welding



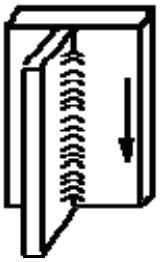
Horizontal-Vertical in fillet welding



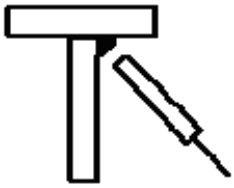
Horizontal in fillet welding



Vertical upward in fillet welding



Vertical downward in fillet welding



Overhead in fillet welding

~~2~~**3** For **4.1.4-1(2)**, **Part M** of the Rules, even though the test assembly is dispensed with the hardness test specified in **4.2.9** and **4.3.6**, **Part M** of the Rules, thickness of range of approval is to be restricted to the thickness of test assembly if three of the hardness values in the heat affected zone are exceed 325HV for Rolled Steels for Hull and 395HV for High Strength Quenched and Tempered Rolled Steel Plates for Structure.

~~3~~**4** The wording "deemed appropriate by the Society" specified in **4.1.4-2, Part M** of the Rules means the following **(1)** to **(3)**.

(1) Heat input

Heat input of welding for actual works is to be complied with the requirements specified in the following **(a)** and **(b)**.

(a) The upper limit of heat input approved is 1.25 times the heat input used in welding the test piece, but not over 55*kJ/cm*. However, for high heat input processes specified in **Table 4.2 Notes(5)**, **Part M** of the Rules, the upper limit is 1.1 time the heat input used in welding the test piece.

(b) The lower limit of heat input approved is 0.75 times the heat input used in welding the test piece.

(2) Preheating and interpass temperature

Preheating and interpass temperature for actual work are to be complied with the requirements specified in the following **(a)** and **(b)**.

(a) The minimum preheating temperature is that used in the qualification test.

(b) The maximum interpass temperature is that used in the qualification test.

(3) Post-weld heat treatment

The heat treatment used in the qualification test is to be maintained during actual work. Holding time may be adjusted as a function of thickness.

~~4~~**5** 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 and aluminium alloys are to be complied with the requirements specified in the following **(1)** and **(2)**, provided that the applied welding condition is the same.

(1) Rolled Stainless Steel

For rolled stainless steel, **4.1.4-1, Part M of the Rules** and preceding **-2** (excluding the requirements of large heat input welding) is to be applied. However, the kind of steel is 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.

(2) Aluminium Alloys

The requirements specified in the following **(a)** thorough **(g)** are to be applied.

(a) Type of welded joints

Type of welded joints is to be as specified in **Table M4.1.4-~~2~~3**. Where the welding procedures of butt welded joints are approved, the fillet welded joints corresponding to the welding position are to be included.

(b) Thickness

Range of thickness is to be as specified in **Table M4.1.4-~~3~~4**.

(c) Throat thickness of fillet welds

Throat thickness of fillet welds is to be as specified in **Table M4.1.4-~~4~~5**.

(d) Kind of aluminium alloys

Kind of aluminium alloys is to be as specified in **Table M4.1.4-~~5~~6**.

(e) Kind of welding consumables

Range of approval for welding consumables is to be as specified in the followings.

(i) Welding consumables having the same grade as used for the procedure qualification tests.

(ii) Welding consumables having the higher specified strength than the welding consumable used for the procedure qualification tests.

(f) Preheat and interpass temperature

Preceding **-~~3~~4(2)** is to be applied.

(g) Joints for combination welding procedure

In the joint welded by dissimilar processes (combination welding), the subsequent process may be excluded, provided the weldings are applied within the approved thickness range and no alteration of the welding sequence from approved condition is made.

Table M4.1.4-~~2~~3 Type of Welded Joint

Type of welded joint for test assembly				Range of approval
Butt welding	One side	With backing	A	A, C, D
		Without backing	B	A, B, C, D
	Both side	With gouging	C	C
		Without gouging	D	C, D
Fillet welding			E	E

Table M4.1.4-~~3~~4 Thickness

Thickness of test assembly t (mm)[1]	Range of approval			
	Butt welding			Fillet welding
	Single-run	Two-run (Single-run from both sides)	Multi-run	
$t \leq 100$	$0.8t$ to $1.1t$		$0.5t$ to $2t$[2] (max. 150mm)	
$100 < t$	To be in accordance with the discretion of the Society.			

Notes:

(1) In case of joints between dissimilar thickness, thickness t is to be in accordance with the followings.
Butt joints: t is the thickness of the thinner plate
Fillet joints: t is the thickness of the thicker plate

(2) For combination welding procedure, maximum thickness is to be t (See **M4.1.4-5(2)(g)**).

Table M4.1.4-~~4~~5 Throat Thickness of Fillet Welds

Throat thickness of test assembly ℓ (mm)	Range of approval
$\ell < 10$	1.5ℓ max. (max. 10mm)
$10 \leq \ell$	ℓ

Table M4.1.4-~~5~~6 Kind of Aluminium Alloys

Grade of test assembly			Material's classification	Range of approval[2]
Aluminium alloys[1]	5000 series	5754*P*	A	(A－A)
		5086*P*, 5086*S*	B1	(A－A), (B1－B1), (A－B1)
		5083*P*, 5083*S*	B2	(A－A), (B1－B1), (B2－B2) (A－B1), (A－B2), (B1－B2)
	6000 series	6005*AS* 6061*P*, 6061*S* 6082*S*	C	(C－C)

Notes:

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

(2) Combination of the same material's classification includes welded joints of different grade of aluminium alloys within the same material's classification. Combination of the different material's classification includes welded joints of different grade of aluminium alloys within each material's classification.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 15 April 2010.

Amendment 1-2

M4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

M4.2 Tests for Butt Welded Joints

Paragraph M4.2.7 has been amended as follows.

M4.2.7 Impact Tests

~~The wording "agreed by the Society" specified in~~ With respect to **Table4.7 Notes (1), Part M of the Rules**, the wording "impact test requirements deemed appropriate by the Society" ~~is to be complied with the requirements specified in~~ refers to the followings.

(1) Where the thickness of test assemblies is more than 50*mm* and not exceeding 70*mm*, ~~in addition to requirements of impact test specified in **Fig. M4.2** and **Fig. M4.3, Part M** of the Rules, brittle fracture test may be required. In this case, impact test requirements are to be complied with the requirements specified~~ values in **Table M4.2.7-1**.

(2) Where the thickness of test assemblies is exceeding 70*mm*, ~~impact test and brittle fracture test (or submission of technical documents for brittle fracture test)~~ values deemed appropriate by the Society ~~are to be carried out~~.

Table M4.2.7-1 has been amended as follows.

Table M4.2.7-1 Impact Test Requirements for Butt Welded Joint (Rolled Steels for Hull whose thickness of test assemblies is more than 50 *mm* and not exceeding 70 *mm*)

Grade of steel	Testing temperature (℃)	Value of minimum mean absorbed energy (*J*)		
		For manually or semi-automatically welded joints		For automatically welded joints
		Downhand, Horizontal Overhead	Vertical upward, Vertical downward	
KA(1)	20	47	41	41
KB(1), *KD*	0			
KE	-20			
*KA*32, *KA*36	20			
*KD*32, *KD*36	0			
*KE*32, *KE*36	-20			
*KF*32, *KF*36	-40			
*KA*40	20		46	46
*KD*40	0			
*KE*40	-20			
*KF*40	-40			

Note:

(1) For a bond and heat affected zone, value of minimum mean absorbed energy is to be 34*J*.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 15 April 2010.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to welding procedure other than those for which the application for approval is submitted to the Society on or after the effective date.