RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part M Welding

2013 AMENDMENT NO.1

Rule No.80 27th December 2013

Resolved by Technical Committee on 29th July 2013

Approved by Board of Directors on 24th September 2013

Rule No.80 27th December 2013

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

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) (4)
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, 63*Y*47
	*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, 63*Y*47
	*KF*40	54*Y*40, 4*Y*42, 5*Y*42, 4*Y*46, 5*Y*46
	*KE*47	63*Y*47
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*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*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*420	4*Y*42, 5*Y*42, 4*Y*46, 5*Y*46, 4*Y*50, 5*Y*50
	*KF*420	5*Y*42, 5*Y*46, 5*Y*50
	*KA*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*460	3*Y*46, 4*Y*46, 5*Y*46, 3*Y*50, 4*Y*50, 5*Y*50
	*KE*460	4*Y*46, 5*Y*46, 4*Y*50, 5*Y*50
	*KF*460	5*Y*46, 5*Y*50
	*KA*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*500	3*Y*50, 4*Y*50, 5*Y*50, 3*Y*55, 4*Y*55, 5*Y*55
	*KE*500	4*Y*50, 5*Y*50, 4*Y*55, 5*Y*55
	*KF*500	5*Y*50, 5*Y*55
	*KA*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*550	3*Y*55, 4*Y*55, 5*Y*55, 3*Y*62, 4*Y*62, 5*Y*62
	*KE*550	4*Y*55, 5*Y*55, 4*Y*62, 5*Y*62
	*KF*550	5*Y*55, 5*Y*62
	*KA*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*620	3*Y*62, 4*Y*62, 5*Y*62, 3*Y*69, 4*Y*69, 5*Y*69
	*KE*620	4*Y*62, 5*Y*62, 4*Y*69, 5*Y*69
	*KF*620	5*Y*62, 5*Y*69

	*KA*690	2*Y*69, 3*Y*69, 4*Y*69, 5*Y*69
	*KD*690	3*Y*69, 4*Y*69, 5*Y*69
	*KE*690	4*Y*69, 5*Y*69
	*KF*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.

(4) For welding consumables used for the corrosion resistant steel for cargo oil tanks specified in **3.13, Part K**, only welding consumables whose brands are listed in the "Particulars of Approval Conditions" for the corrosion resistant steel for cargo oil tanks are to be used. In cases where welding consumables not listed are used, measures deemed appropriate by the Society are to be taken.

Chapter 4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

4.2 Tests for Butt Welded Joints

4.2.1 Application

Table M4.4 has been amended as follows.

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

<table>
<tr><td colspan="2">Kind and grade of test assembly</td><td colspan="7">Kinds of test and number of specimens (1)</td></tr>
<tr><td colspan="2"></td><td>Visual inspection</td><td>Tensile test</td><td>Bend test</td><td>Impact test (sets) (2)</td><td>Macro-Structure inspection</td><td>Hardness test</td><td>Non-destructive inspection (3)</td></tr>
<tr><td rowspan="2">Rolled steel for hull</td><td>KA, KB, KD, KE KA32, KD32, KE32, KF32, KA36, KD36, KE36, KF36, KA40, KD40, KE40, KF40</td><td rowspan="4">Whole length of welding joints</td><td rowspan="3">2</td><td rowspan="3">4(5)</td><td>3～8 <a,b,c,d,e>(7)</td><td rowspan="4">1</td><td rowspan="2">1(10)</td><td rowspan="4">Whole length of welding joints</td></tr>
<tr><td><u>KE47</u></td><td><u>4～8 <a,b,c,d,e>(7)</u></td></tr>
<tr><td rowspan="2">Rolled steels for lower temperature service</td><td>KL24A, KL24B, KL27, KL33, KL37, KL2N30, KL3N32, KL5N43</td><td rowspan="2">5 <A,B,C,D,E>(8)</td><td rowspan="2">—</td></tr>
<tr><td>KL9N53, KL9N60</td><td>4(4)</td><td>2(6)</td></tr>
<tr><td colspan="9">(The rest is omitted.)</td></tr>
</table>

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)** , **(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 *KA*36, *KD*36, *KE*36, *KF*36, *KA*40, *KD*40, *KE*40 ~~and~~ , *KF*40 and *KE*47 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 6,000 series with tensile strength 260 N/mm^2 and above may be used.

4.2.7 Impact Tests

Sub-paragraph -7 has been amended as follows.

7 In cases where maximum thickness to be approved is more than 50*mm* but not exceeding 70*mm*, *CTOD* tests or deep notch tests (hereinafter referred to as "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 (°C)	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			

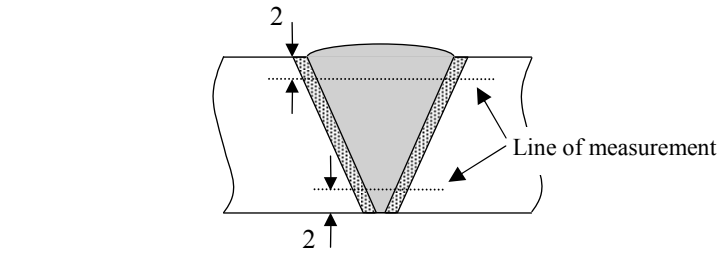
Notes:
(1) In cases where the thickness of test assemblies exceeds 50*mm* or *KE*47 is used, impact test requirements deemed appropriate by the Society are to be applied.
(2) A set of test specimens is considered to have failed if the value of absorbed energy of more than two test specimens is less than 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*.

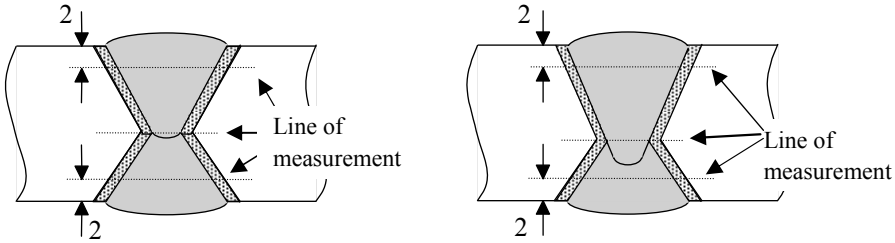
4.2.9 Hardness Test

Fig. M4.5 has been amended as follows.

Fig. M4.5 Hardness test (Unit: *mm*)



(a) For One side



(b) For Both side

Notes:

(1) For each row of indentations there shall be a minimum of 3 individual indentations in the world metal, the heat affected zones (both side) and the base metal (both sides).
(2) Measuring intervals are to be 1*mm* on the basis of the bond.
(3) Measuring load is to be 10*kg* Vickers.
(4) For *KE*47, measurement at mid thickness line of is to be added.

Table M4.10 has been amended as follows.

Table M4.10 Requirements of hardness test

Kinds of specimen	Vickers hardness (*HV*10)
Rolled steels for hull(1)	350 max(2)
Quenched and tempered high tensile rolled steel for structure	420 max

Notes:

(1) 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.
(2) For *KE*47, Vickers hardness is not to be more than 380.

Chapter 6 WELDING CONSUMABLES

6.2 Electrodes for Manual Arc Welding for Mild and High Tensile Steels and Steels for Low Temperature Service

6.2.2 Grades and Marks of Electrode

Table M6.1 has been amended as follows.

Table M6.1 Grades and Marks

For mild steel	For high tensile steel	For steel for low temperature service
*KMW*1	*KMW*52,*KMW*52*Y*40	*KMWL*1, *KMWL*91
*KMW*2	*KMW*53,*KMW*53*Y*40	*KMWL*2, *KMWL*92
*KMW*3	*KMW*54,*KMW*54*Y*40	*KMWL*3
	*KMW*63*Y*47	

6.2.4 General Provisions for Test

Table M6.2 has been amended as follows.

Table M6.2 Kinds of Test for Electrode

Kind of test	Test assembly					Kind and no. of test specimens taken from test assembly
	Welding position	Diameter of electrode (*mm*)	No. of test assemblies	Dimensions of test assembly	Thickness(9) (*mm*)	
Deposited metal test	Flat	4	1(1)	**Fig. M6.1**	20	Tensile test specimen : 1 Impact test specimen : 3
		max. diameter	1(1)			
Butt weld test	Flat	First run : 4, Subsequent runs : 5 or over, Last two runs : max. dia.	1	**Fig. M6.2**	15～20	Tensile test specimen : 1 Face bend specimen : 1 Root bend specimen : 1 Impact test specimen : 3
		First run : 4, Second run : 5 or 6, Subsequent runs :max. dia.	1(2)			
	Horizontal (4)	First run : 4 or 5, Subsequent runs : 5	1			
	Vertical upward	First run : 3.2, Subsequent runs : 4 or 5	1			
	Vertical downward	(3)	1			
	Overhead	First run : 3.2, Subsequent runs : 4 or 5	1			
Fillet weld test (5)	Horizontal vertical	The First side : max. dia. , The Second side : min. dia.	1	**Fig. M6.3**	20	Macro test specimen(7): 3 Hardness test specimen(7): 3 Fracture test specimen : 2
Hydrogen test(6)	Flat	4	4	(8)	12	Hydrogen test specimen : 1

Notes:

((1) to (8) are omitted)

(9) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

Table M6.3 has been amended as follows.

Table M6.3 Kinds of Test for Electrode

Kind of test	Test assembly					Kind and no. of test specimens taken from test assembly
	Welding position	Diameter of electrode (*mm*)	No. of test assemblies	Dimensions of test assembly	Thickness[4] (*mm*)	
Deposited metal test	Flat	4	1	**Fig. M6.1**	20	Tensile test specimen : 1
		max. diameter	1			Impact test specimen : 3
Fillet weld test	Flat	The first side : max. dia. The Second side : min. dia.	1	**Fig. M6.3**	20	Macro test specimen[1]: 3 Hardness test specimen[1]: 3 Fracture test specimen : 2
	Horizontal vertical		1			
	Vertical upward		1			
	Vertical downward		1			
	Overhead		1			
Hydrogen test[2]	Flat	4	4	[3]	12	Hydrogen test specimen : 1

Notes:

(1) Test specimens used in macro tests and hardness tests are considered to be the same.

(2) To conduct solely for low hydrogen electrodes.

(3) Dimensions of test assembly are to be as specified in **6.2.5-3**.

(4) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

Table M6.4 has been amended as follows.

Table M6.4 Grades of Steel used for Test Assembly

Grade of electrode	Grade of steel used for test assembly[1] [2]
*KMW*1	*KA*
*KMW*2	*KA*, *KB* or *KD*
*KMW*3	*KA*, *KB*, *KD* or *KE*
*KMW*52	*KA*32, *KA*36, *KD*32 or *KD*36
*KMW*53	*KA*32, *KA*36, *KD*32, *KD*36, *KE*32 or *KE36*
*KMW*54	*KA*32, *KA*36, *KD*32, *KD*36, *KE*32, *KE*36, *KF*32 or *KF*36
*KMW*52*Y*40	*KA*40 or *KD*40
*KMW*53*Y*40	*KA*40, *KD*40 or *KE*40
*KMW*54*Y*40	*KA*40, *KD*40, *KE*40 or *KF*40
*KMW*63*Y*47	*KE*47
*KMWL*1	*KE* or *KL*24*A*
*KMWL*2	*KE*, *KL*24*A*, *KL*24*B*, *KL*27 or *KL*33
*KMWL*3	*KL*27, *KL*33 or *KL*37
*KMWL*91	*KL*9*N*53 or *KL*9*N*60
*KMWL*92	*KL*9*N*53 or *KL*9*N*60

Notes:

(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 for *KMWL*91 and *KMWL*92.

(2) The tensile strength of high tensile steels *KA*32, *KD*32, *KE*32 and *KF*32 used in the butt weld test assemblies are to be greater than 490*N/mm*^{2}.

6.2.6 Deposited Metal Tensile Test

Table M6.5 has been amended as follows.

Table M6.5 Tensile Test Requirements for Deposited Metal

Grade of electrode	Tensile Strength (N/mm^2)	Yield point (N/mm^2)	Elongation (%)
*KMW*1	400～560	305 min.	22 min.
*KMW*2			
*KMW*3			
*KMW*52	490～660	375 min.	
*KMW*53			
*KMW*54			
*KMW*52*Y*40	510～690	400 min.	
*KMW*53*Y*40			
*KMW*54*Y*40			
*KMW*63*Y*47	570～720	460 min.	19 min.
*KMWL*1	400～560	305 min.	22 min.
*KMWL*2	440～610	345 min.	
*KMWL*3	490～660	375 min.	21 min.
*KMWL*91	590 min.	375(1)min.	25 min.
*KMWL*92	660 min.	410(1)min.	

Note:

(1) 0.2% proof stress

6.2.7 Deposited Metal Impact Test

Table M6.6 has been amended as follows.

Table M6.6 Impact Test Requirements for Deposited Metal

Grade of electrode	Testing temperature (℃)	Minimum mean absorbed energy (*J*)
*KMW*1	20	47
*KMW*2	0	
*KMW*3	-20	
*KMW*52	0	
*KMW*53	-20	
*KMW*54	-40	
*KMW*52*Y*40	0	
*KMW*53*Y*40	-20	
*KMW*54*Y*40	-40	
*KMW*63*Y*47	-20	53
*KMWL*1	-40	34
*KMWL*2	-60	
*KMWL*3	-60	
*KMWL*91	-196	27
*KMWL*92	-196	

6.2.8 Butt Weld Tensile Test

Table M6.7 has been amended as follows.

Table M6.7 Tensile Test Requirements for Butt Weld

Grade of electrode	Tensile Strength (N/mm^2)
*KMW*1, *KMW*2, *KMW*3	400 min.
*KMW*52, *KMW*53, *KMW*54	490 min.
*KMW*52*Y*40, *KMW*53*Y*40, *KMW*54*Y*40	510 min.
*KMW*63*Y*47	570 min.
*KMWL*1	400 min.
*KMWL*2	440 min.
*KMWL*3	490 min.
*KMWL*91	630 min.
*KMWL*92	670 min.

6.2.10 Butt Weld Impact Test

Table M6.8 has been amended as follows.

Table M6.8 Impact Test Requirements for Butt Weld

Grade of electrode	Testing temperature (℃)	Minimum mean absorbed energy (*J*)	
		Flat, Horizontal, Overhead	Vertical upward, Vertical downward
*KMW*1	20	47	34
*KMW*2	0		
*KMW*3	-20		
*KMW*52	0		
*KMW*53	-20		
*KMW*54	-40		
*KMW*52*Y*40	0		39
*KMW*53*Y*40	-20		
*KMW*54*Y*40	-40		
*KMW*63*Y*47	-20	53	
*KMWL*1	-40	27	27
*KMWL*2	-60		
*KMWL*3	-60		
*KMWL*91	-196		
*KMWL*92	-196		

6.2.15 Annual Inspections

Table M6.10 has been amended as follows.

Table M6.10 Kind of Test for Annual Inspection

Kind of test	Test assembly					Kind and no. of test specimens taken from test assembly
	Welding position	Diameter of electrode (*mm*)	Number	Dimensions	Thickness[(2)] (*mm*)	
Deposited metal test	Flat	4[(1)]	1	**Fig. M6.1**	20	Tensile test specimen : 1 Impact test specimen : 3
		exceeding 4, 8 max.	1			

Notes:

(1) Where deemed necessary by the Society, butt weld tests in the flat or vertical (either upward or downward) welding position specified in **Table M6.2** of **6.2.4-1** may be requested in place of deposited metal tests of 4*mm* diameter electrodes. In this case, impact test specimens (one set of three) are to be selected.

(2) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

6.3 Automatic Welding Consumables for Mild Steels, High Tensile Steels and Steels for Low Temperature Service

6.3.2 Grades and Marks of Automatic Welding Consumables

Table M6.12 has been amended as follows.

Table M6.12 Grades and Marks

For mild steel	For high tensile steel	For steel for low temperature service
*KAW*1	*KAW*51, *KAW*52*Y*40	*KAWL*1, *KAWL*91
*KAW*2	*KAW*52, *KAW*53*Y*40	*KAWL*2, *KAWL*92
*KAW*3	*KAW*53, *KAW*54*Y*40	*KAWL*3
	*KAW*54, *KAW*63*Y*47	

Table M6.15 has been amended as follows.

Table M6.15 Kind of Test of Automatic Welding Consumables

Welding process	Kinds of test[8]		Grade of welding consumable	Test assembly			Kind and number of test specimens taken from test assembly
				Number	Dimension	Thickness (*mm*) [3] [9]	
Multi-run technique	Deposited metal test		*KAW*1, *KAWL*1 *KAW*2, *KAWL*2 *KAW*3, *KAWL*3 *KAW*51, *KAWL*91 *KAW*52, *KAWL*92	1	**Fig. M6.7**	20	Tensile test specimen : 2 Impact test specimen : 3
	Butt weld test		*KAW*53, *KAW*54, *KAW*52*Y*40 *KAW*53*Y*40 *KAW*54*Y*40 *KAW*63*Y*47	1[4]	**Fig. M6.8**	20～25	Tensile test specimen : 2[4] Face bend test specimen : 2[4] [6] Root bend test specimen : 2[4] [6] Impact test specimen : 3
Two-run technique	Butt Weld test	Submerged arc welding	*KAW*1, *KAW*51	1	**Fig. M6.9**	12～15	Tensile test specimen : 2 Longitudinal tensile test specimen : 1[5] Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 3
				1		20～25	
			*KAW*2, *KAW*52*Y*40 *KAW*3, *KAW*53*Y*40 *KAW*52, *KAW*54*Y*40	1		20～25	
			*KAW*53, *KAW*54, *KAW*63*Y*47	1		30～35	
		Gas shielded arc and self-shielded arc welding	*KAW*1, *KAW*2 *KAW*3 *KAW*51, *KAW*52	1		12～15[1]	Tensile test specimen : 2 Longitudinal tensile test specimen : 1[5] Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 3
						20[2]	
			*KAW*53, *KAW*54	1		20～25[1]	
			*KAW*52*Y*40 *KAW*53*Y*40 *KAW*54*Y*40 *KAW*63*Y*47			30～35[2]	
	Butt weld test		*KAWL*1, *KAWL*2 *KAW*3, *KAWL*91 *KAWL*92	1		12～15	Tensile test specimen : 2 Longitudinal tensile test specimen : 1[5] Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 3
				1		20～25	
Multi-run and two-run technique	Deposited metal test		*KAW*1, *KAWL*1 *KAW*2, *KAWL*2 *KAW*3, *KAWL*3 *KAW*51, *KAWL*91 *KAW*52, *KAWL*92	[7]			
	Butt weld test		*KAW*53 *KAW*54 *KAW*52*Y*40 *KAW*53*Y*40 *KAW*54*Y*40 *KAW*63*Y*47				

Notes:

((1) to (8) are omitted.)

(9) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

6.3.4 General Provisions for Tests

Table M6.16 has been amended as follows.

Table M6.16 Grades of Steel used for Test Assembly

Grade of welding consumable	Grade of steel used for test assembly(1) (2)
*KAW*1	*KA*
*KAW*2	*KA*, *KB* or *KD*
*KAW*3	*KA*, *KB*, *KD* or *KE*
*KAW*51	*KA*32 or *KA*36
*KAW*52	*KA*32, *KA*36, *KD*32 or *KD*36
*KAW*53	*KA*32, *KA*36, *KD*32, *KD*36, *KE*32 or *KE*36
*KAW*54	*KA*32, *KA*36, *KD*32, *KD*36, *KE*32, *KE*36, *KF*32 or *KF*36
*KAW*52*Y*40	*KA*40 or *KD*40
*KAW*53*Y*40	*KA*40, *KD*40 or *KE*40
*KAW*54*Y*40	*KA*40, *KD*40, *KE*40 or *KF*40
*KAW*63*Y*47	*KE*47
*KAWL*1	*KE* or *KL*24*A*
*KAWL*2	*KE*, *KL*24*A*, *KL*24B, *KL*27 or *KL*33
*KAWL*3	*KL*27, *KL*33 or *KL*37
*KAWL*91	*KL*9*N*53 or *KL*9*N*60
*KAWL*92	*KL*9*N*53 or *KL*9*N*60

Notes:

(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 for *KAWL*91 and *KAWL*92.

(2) The tensile strength of high tensile steels *KA*32, *KD*32, *KE*32 and *KF*32 used in the butt weld test assemblies are to be greater than 490N/mm^2.

6.3.6 Deposited Metal Tensile Test with Multi-run Technique

Table M6.17 has been amended as follows.

Table M6.17 Tensile Test Requirements for Deposited Metal

Grade of welding consumable	Tensile strength (N/mm^2)	Yield point (N/mm^2)	Elongation (%)
*KAW*1	400～560	305 min.	22 min.
*KAW*2			
*KAW*3			
*KAW*51	490～660	375 min.	
*KAW*52			
*KAW*53			
*KAW*54			
*KAW*52*Y*40	510～690	400 min.	
*KAW*53*Y*40			
*KAW*54*Y*40			
*KAW*63*Y*47	570～720	460 min.	19 min.
*KAWL*1	400～560	305 min.	22 min.
*KAWL*2	440～610	345 min.	
*KAWL*3	490～660	375 min.	21 min.
*KAWL*91	590 min.	375(1) min.	25 min.
*KAWL*92	660 min.	410(1) min.	

Note:
(1) 0.2% proof stress

6.3.7 Deposited Metal Impact Test with Multi-run Technique

Table M6.18 has been amended as follows.

Table M6.18 Impact Test Requirements for Deposited Metal

Grade of Welding consumable	Testing temperature (℃)	Minimum mean absorbed energy (*J*)
*KAW*1	20	34
*KAW*2	0	
*KAW*3	-20	
*KAW*51	20	
*KAW*52	0	
*KAW*53	-20	
*KAW*54	-40	
*KAW*52*Y*40	0	39
*KAW*53*Y*40	-20	
*KAW*54*Y*40	-40	
*KAW*63*Y*47	-20	53
*KAWL*1	-40	27
*KAWL*2	-60	
*KAWL*3	-60	
*KAWL*91	-196	
*KAWL*92	-196	

6.3.8 Butt Weld Tensile Test with Multi-run Technique

Table M6.19 has been amended as follows.

Table M6.19 Tensile Test Requirements for Butt Weld

Grade of welding consumable	Tensile Strength (N/mm^2)
*KAW*1, *KAW*2, *KAW*3	400 min.
*KAW*51, *KAW*52, *KAW*53, *KAW*54	490 min.
*KAW*52*Y*40, *KAW*53*Y*40, *KAW*54*Y*40	510 min.
*KAW*63*Y*47	570 min.
*KAWL*1	400 min.
*KAWL*2	440 min.
*KAWL*3	490 min.
*KAWL*91	630 min.
*KAWL*92	670 min.

6.3.15 Annual Inspections

Table M6.20 has been amended as follows.

Table M6.20 Kind of Test for Annual Inspection

Grade of welding consumable	Welding process	Kinds of test		Test assembly			Kind and number of test specimens taken from test assembly
				Number	Dimension	Thickness(2) (*mm*)	
*KAW*1 *KAW*2 *KAW*3 *KAW*51 *KAW*52 *KAW*53 *KAW*54 *KAW*52*Y*40 *KAW*53*Y*40 *KAW*54*Y*40 *KAW*63*Y*47	Multi-run technique	Deposited metal test		1	**Fig. M6.7**	20	Tensile test specimen : 1 Impact test specimen : 3
	Two-run technique	Butt weld test	Submerged arc welding	1	**Fig. M6.9**	20	Tensile test specimen : 1 Longitudinal tensile test specimen : 1 Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 3
			Gas shielded arc and shield arc welding	1		20～25	Tensile test specimen : 1 Longitudinal tensile test specimen : 1 Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 3
*KAWL*1 *KAWL*2 *KAWL*3 *KAWL*91 *KAWL*92	Multi-run and two-run technique	Deposited metal test		1	**Fig. M6.7**	20	Tensile test specimen : 1 Impact test specimen : 3
		Butt(1) weld test	Submerged arc welding	1	**Fig. M6.9**	20	Tensile test specimen : 1 Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 3
			Gas shielded arc and shield arc welding	1		20～25	Tensile test specimen : 1 Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 3

Notes:

(1) Butt weld test for multi-run and two-run technique is to be carried out by two-run technique.

(2) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

6.4 Semi-automatic Welding Consumables for Mild Steels, High Tensile Steels and Steels for Low Temperature Service

6.4.2 Grades and Marks of Semi-automatic Welding Consumables

Table M6.21 has been amended as follows.

Table M6.21 Grades and Marks

For mild steel	For high tensile steel	For steel for low temperature service
*KSW*1 *KSW*2 *KSW*3	*KSW*51, *KSW*52*Y*40 *KSW*52, *KSW*53*Y*40 *KSW*53, *KSW*54*Y*40 *KSW*54, *KSW*63*Y*47	*KSWL*1, *KSWL*91 *KSWL*2, *KSWL*92 *KSWL*3

6.4.4 General Provisions for Tests

Table M6.22 has been amended as follows.

Table M6.22 Kind of Test for Semi-Automatic Welding Consumable

Kinds of test(6)	Test assembly					Kind and number of test specimens taken from test assembly
	Welding position	Wire diameter (*mm*)	Number	Dimensions	Thickness(7) (*mm*)	
Deposited metal test	Flat	maximum diameter	1(1)	**Fig. M 6.1**	20	Tensile test specimen: 1 Impact test specimen: 3
		minimum diameter	1(1)			
Butt weld test	Flat	First-run : minimum diameter Remaining-run : maximum diameter	1(2)	**Fig. M 6.2**	15～20	Tensile test specimen: 1 Face bend test specimen: 1 Root bend test specimen: 1 Impact test specimen: 3
	Horizontal(3)		1			
	Vertical upward		1			
	Vertical downward		1			
	Overhead		1			
Fillet weld test	Horizontal fillet(4)	The first side : Maximum diameter The second side : minimum diameter	1	**Fig. M 6.3**	20	Macro test specimen: 3(5) Hardness test specimen: 3(5) Fracture test specimen: 2

Notes:

((1) to (6) are omitted.)

(7) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

Table M6.23 has been amended as follows.

Table M6.23 Grades of Steel used for Test Assembly

Grade of welding consumable	Grade of steel used for test assembly(1) (2)
*KSW*1	*KA*
*KSW*2	*KA*, *KB* or *KD*
*KSW*3	*KA*, *KB*, *KD* or *KE*
*KSW*51	*KA*32 or *KA*36
*KSW*52	*KA*32, *KA*36, *KD*32 or *KD*36
*KSW*53	*KA*32, *KA*36, *KD*32, *KD*36, *KE*32 or *KE*36
*KSW*54	*KA*32, *KA*36, *KD*32, *KD*36, *KE*32, *KE*36, *KF*32 or *KF*36
*KSW*52*Y*40	*KA*40 or *KD*40
*KSW*53*Y*40	*KA*40, *KD*40 or *KE*40
*KSW*54*Y*40	*KA*40, *KD*40, *KE*40 or *KF*40
*KSW*63*Y*47	*KE*47
*KSWL*1	*KE* or *KL*24*A*
*KSWL*2	*KE*, *KL*24*A*, *KL*24*B*, *KL*27 or *KL*33
*KSWL*3	*KL*27, *KL*33 or *KL*37
*KSWL*91	*KL*9*N*53 or *KL*9*N*60
*KSWL*92	*KL*9*N*53 or *KL*9*N*60

Notes:

(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 for *KSWL*91 and *KSWL*92.

(2) The tensile strength of high tensile steels *KA*32, *KD*32, *KE*32 and *KF*32 used in the test assemble is to be greater than 490N/mm^2.

6.4.6 Deposited Metal Tensile Test

Table M6.24 has been amended as follows.

Table M6.24 Tensile Test Requirements for Deposited Metal

Grade of welding consumable	Tensile Strength (N/mm^2)	Yield point (N/mm^2)	Elongation (%)
*KSW*1	400～560	305 min.	22 min.
*KSW*2			
*KSW*3			
*KSW*51	490～660	375 min.	
*KSW*52			
*KSW*53			
*KSW*54			
*KSW*52*Y*40	510～690	400 min.	
*KSW*53*Y*40			
*KSW*54*Y*40			
*KSW*63*Y*47	570～720	460 min.	19 min.
(The rest is omitted.)			

Note:
(1) 0.2% proof stress

6.4.7 Deposited Metal Impact Test

Table M6.25 has been amended as follows.

Table M6.25 Impact Test Requirements for Deposited Metal

Grade of welding consumable	Testing temperature (℃)	Minimum mean absorbed energy (*J*)
*KSW*1	20	47
*KSW*2	0	
*KSW*3	-20	
*KSW*51	20	
*KSW*52	0	
*KSW*53	-20	
*KSW*54	-40	
*KSW*52*Y*40	0	
*KSW*53*Y*40	-20	
*KSW*54*Y*40	-40	
*KSW*63*Y*47	-20	53
*KSWL*1	-40	34
*KSWL*2	-60	
*KSWL*3	-60	
*KSWL*91	-196	27
*KSWL*92	-196	

6.4.8 Butt Weld Tensile Test

Table M6.26 has been amended as follows.

Table M6.26 Tensile Test Requirements for Butt Weld

Grade of welding consumable	Tensile Strength (N/mm^2)
*KSW*1, *KSW*2, *KSW*3	400 min.
*KSW*51, *KSW*52, *KSW*53, *KSW*54	490 min.
*KSW*52*Y*40, *KSW*53*Y*40, *KSW*54*Y*40	510 min.
*KSW*63*Y*47	570 min.
*KSWL*1	400 min.
*KSWL*2	440 min.
*KSWL*3	490 min.
*KSWL*91	630 min.
*KSWL*92	670 min.

6.4.10 Butt Weld Impact Test

Table M6.27 has been amended as follows.

Table M6.27 Impact Test Requirements for Butt Weld

Grade of welding consumable	Testing temperature (℃)	Minimum mean absorbed energy (*J*)	
		Flat, Horizontal, Overhead	Vertical upward, Vertical downward
*KSW*1	20	47	34
*KSW*2	0		
*KSW*3	-20		
*KSW*51	20		
*KSW*52	0		
*KSW*53	-20		
*KSW*54	-40		
*KSW*52*Y*40	0		39
*KSW*53*Y*40	-20		
*KSW*54*Y*40	-40		
*KSW*63*Y*47	-20	53	
*KSWL*1	-40	27	27
*KSWL*2	-60		
*KSWL*3	-60		
*KSWL*91	-196		
*KSWL*92	-196		

6.4.15 Annual Inspections

Table M6.28 has been amended as follows.

Table M6.28 Kind of Test for Annual Inspection

Kind of test	Test assembly					Kind and no. of test specimens taken from test assembly
	Welding position	Diameter of wire (*mm*)	Number	Dimensions	Thickness[2] (*mm*)	
Deposited metal test	Flat	[1]	1	**Fig. M6.1**	20	Tensile test specimen : 1 Impact test specimen : 3

Notes:

(1) The diameters of the wire are to be within the range specified by the manufacturers.

(2) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

6.5 Electro-slag and Electro-gas Welding Consumables

6.5.2 Grades and Marks of Welding Consumables

Table M6.29 has been amended as follows.

Table M6.29 Grades and Marks

For mild steel	For high tensile steel	
*KEW*1	*KEW*51	*KEW*52*Y*40
*KEW*2	*KEW*52	*KEW*53*Y*40
*KEW*3	*KEW*53	*KEW*54*Y*40
	*KEW*54	*KEW*63*Y*47

Table M6.30 has been amended as follows.

Table M6.30 Kind of Test for Electro-slag and Electro-gas Welding Consumables

Kind of test	Test assembly			Kinds and no. of test specimens taken from test assembly
	Number	Dimensions	Thickness[1] [2] (*mm*)	
Butt weld test	1	**Fig.M6.12**	20～25	Tensile test specimen : 2 Longitudinal tensile test specimen : 2 Side bend test specimen : 2 Impact test specimen : 6 Macro test specimen : 2
	1		35～45	

Notes:

(1) Where thickness is restricted by welding process, thickness of test assemblies may be changed upon approval of the Society. In this case, the maximum thickness of test assemblies in thickness restrictions is to be taken as the maximum applicable thickness, as is to be certificated.

(2) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

6.5.4 General Provisions for Tests

Table M6.31 has been amended as follows.

Table M6.31 Grades of Steel used for Test Assembly

Grade of welding consumable	Grade of steel used for test assembly(1)
*KEW*1	*KA*
*KEW*2	*KA*, *KB* or *KD*
*KEW*3	*KA*, *KB*, *KD* or *KE*
*KEW*51	*KA*32 or *KA*36
*KEW*52	*KA*32, *KA*36, *KD*32 or *KD*36
*KEW*53	*KA*32, *KA*36, *KD*32, *KD*36, *KE*32 or *KE*36
*KEW*54	*KA*32, *KA*36, *KD*32, *KD*36, *KE*32, *KE*36, *KF*32 or *KF*36
*KEW*52*Y*40	*KA*40 or *KD*40
*KEW*53*Y*40	*KA*40, *KD*40 or *KE*40
*KEW*54*Y*40	*KA*40, *KD*40, *KE*40 or *KF*40
*KEW*63*Y*47	*KE*47

(Note is omitted.)

6.5.6 Tensile Test

Table M6.32 has been amended as follows.

Table M6.32 Tensile Test Requirement

Grade of welding consumable	Tensile Strength (N/mm^2)
*KEW*1 *KEW*2 *KEW*3	400 min.
*KEW*51 *KEW*52 *KEW*53 *KEW*54	490 min.
*KEW*52*Y*40 *KEW*53*Y*40 *KEW*54*Y*40	510 min.
*KEW*63*Y*47	570 min.

Table M6.33 has been amended as follows.

Table M6.33 Longitudinal Tensile Test Requirement

Grade of welding consumable	Tensile Strength (N/mm^2)	Yield point (N/mm^2)	Elongation (%)
*KEW*1 *KEW*2 *KEW*3	400～560	305 min.	22 min.
*KEW*51 *KEW*52 *KEW*53 *KEW*54	490～660	375 min.	
*KEW*52*Y*40 *KEW*53*Y*40 *KEW*54*Y*40	510～690	400 min.	
*KEW*63*Y*47	570～720	460 min.	19 min.

6.5.8 Impact Test

Table M6.34 has been amended as follows.

Table M6.34 Impact Test Requirement

Grade of welding consumable	Testing temperature (℃)	Minimum mean absorbed energy (*J*)
*KEW*1	20	34
*KEW*2	0	
*KEW*3	-20	
*KEW*51	20	
*KEW*52	0	
*KEW*53	-20	
*KEW*54	-40	
*KEW*52*Y*40	0	39
*KEW*53*Y*40	-20	
*KEW*54*Y*40	-40	
*KEW*63*Y*47	-20	53

6.5.10 Annual Inspections

Table M6.35 has been amended as follows.

Table M6.35 Kind of Test for Annual Inspection

Kind of test	Test assembly			Kind and no. of test specimens taken from test assembly
	Number	Dimensions	Thickness(1) (3) (4) (*mm*)	
Butt weld test	1	**Fig. M6.12**	20~25	Tensile test specimen : 1 Longitudinal Tensile test specimen : 1 Side bend test specimen : 2 Impact test specimen : 6(1) Macro test specimen : 1(2)

Notes:

(1) Where approved by the Society, 3 pieces of impact test specimen may be taken from the centre of welded part.

(2) The surface to be tested is to be vertical to the test assembly surface.

(3) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

(4) In cases where testing is difficult to carry out under the applied welding process, the specified value in this table may be changed.

6.6 One Side Automatic Welding Consumables for Mild Steels, High Tensile Steels and Steels for Low Temperature Service

6.6.2 Grades and Marks of Welding Consumables

Table M6.37 has been amended as follows.

Table M6.37 Kinds of Test for One-side Automatic Welding Consumable

Grade of welding consumable	Welding process	Kinds of test[5]	Test assembly			Kind and number of test specimens taken from test assembly
			Number	Dimension	Thickness[1] [8] (*mm*)	
*KAW*1	One-run technique	Butt weld test	1	**Fig. M6.14**	12～15	Tensile test specimen : 2 Longitudinal tensile test specimen : 1 Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 6[4] Macro-etching test specimen : 1
*KAW*2 *KAW*3 *KAW*51 *KAW*52			1		20～25	
*KAW*53	Multi-run technique		1		12～15[2]	Tensile test specimen : 2 Longitudinal tensile test specimen : 1 Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 6[4] Macro-etching test specimen : 1
*KAW*54					20～25[3]	
*KAW*52*Y*40 *KAW*53*Y*40 *KAW*54*Y*40 *KAW*63*Y*47 *KAWL*1			1		20～25[2] 30～35[3]	
*KAWL*2 *KAWL*3 *KAWL*91 *KAWL*92	One-run and Multi-run technique		1		12～15[6]	Tensile test specimen : 2 Longitudinal tensile test specimen : 1 Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 6[4] Macro-etching test specimen : 1
			1		20～25[2] [7] 30～35[3] [7]	

Notes:

(1) Where thickness is restricted by welding process, thickness of test assemblies may be changed upon approval of the Society. In this case, the maximum thickness of test assemblies restrictions is to be taken as the maximum applicable thickness, and is to be certified.

(2) Thickness of test assemblies corresponding to single electrodes.

(3) Thickness of test assemblies corresponding to multiple electrodes.

(4) Where thickness of test assemblies ranges between 12～15*mm*, the test specimens are to be 1 set of 3 impact test specimens given in **Fig. M 6.15(b)**.

(5) The hydrogen test may be carried out at the request of the manufacturer.

(6) Thickness of test assembly for one-run technique.

(7) Thickness of test assembly for multi-run technique.

(8) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

6.6.4 General Provisions for Tests

Table M6.38 has been amended as follows.

Table M6.38 Grades of Steel used for Test Assembly

Grade of welding consumable	Grade of steel used for test assembly(1)
*KAW*1	*KA*
*KAW*2	*KA*, *KB* or *KD*
*KAW*3	*KA*, *KB*, *KD* or *KE*
*KAW*51	*KA*32 or *KA*36
*KAW*52	*KA*32, *KA*36, *KD*32 or *KD*36
*KAW*53	*KA*32, *KA*36, *KD*32, *KD*36, *KE*32 or *KE*36
*KAW*54	*KA*32, *KA*36, *KD*32, *KD*36, *KE*32, *KE*36, *KF*32 or *KF*36
*KAW*52*Y*40	*KA*40 or *KD*40
*KAW*53*Y*40	*KA*40, *KD*40 or *KE*40
*KAW*54*Y*40	*KA*40, *KD*40, *KE*40 or *KF*40
*KAW*63*Y*47	*KE*47
*KAWL*1	*KE* or *KL*24*A*
*KAWL*2	*KE*, *KL*24*A*, *KL*24*B*, *KL*27 or *KL*33
*KAWL*3	*KL*27, *KL*33 or *KL*37
*KAWL*91	*KL*9*N*53 or *KL*9*N*60
*KAWL*92	*KL*9*N*53 or *KL*9*N*60

Note:

(1) The tensile strength of high tensile steels *KA*32, *KD*32, *KE*32 and *KF*32 used in the test assemble is to be greater than 490*N/mm*^{2}.

6.6.11 Annual Inspections

Table M6.39 has been amended as follows.

Table M6.39 Kinds of Test at Annual Inspection

Grade of welding consumable	Welding process	Kinds of test	Test assembly			Kind and number of test specimens taken from test assembly
			Number	Dimension	Thickness(3) (*mm*)	
*KAW*1 *KAW*2 *KAW*3 *KAW*51 *KAW*52	One-run technique	Butt weld(2) test	1	**Fig. M6.14**	20	Tensile test specimen : 1 Longitudinal tensile test specimen : 1 Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 3(1)
*KAW*53 *KAW*54 *KAW*52*Y*40 *KAW*53*Y*40 *KAW*54*Y*40 *KAW*63*Y*47	Multi-run technique		1		20～25	Tensile test specimen : 1 Longitudinal tensile test specimen : 1 Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 3(1)
*KAWL*1 *KAWL*2 *KAWL*3 *KAWL*91 *KAWL*92	One-run and Multi-run technique		1		20～25	Tensile test specimen : 1 Longitudinal tensile test specimen : 1 Face bend test specimen : 1 Root bend test specimen : 1 Impact test specimen : 3(1)

Notes:

(1) The positions of notch and selection of impact test specimens are to be as given in **Fig. M6.15(b)**.

(2) The butt weld tests for one-run and multi-run technique are to be carried out by one-run technique.

(3) Thicknesses of *KE*47 steel used as test specimens may be reduced to the thicknesses in the table by machining before welding.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 January 2014.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE

Part M Welding

2013 AMENDMENT NO.1

Notice No.69 27th December 2013

Resolved by Technical Committee on 29th July 2013

Notice No.69 27th December 2013
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

Table M2.4.3-1 has been amended as follows.

Table M2.4.3-1 Control Standards for Processing and Welding for Rolled Steels for Hull

Items for control standard		Mild steel		High tensile steels (1)						
				Conventional type (2)			*TMCP* type			
		Grade	Control standard	Grade	Control standard		Grade	Carbon equivalent for steel C_{eq} (3)(4)(5)	Control standard	
Length of short bead (6)	Tack and repair weld of scar	*KE*	30*mm* or over	*KA*32 *KD*32 *KE*32 *KA*36 *KD*36 *KE*36	50*mm* or over (12)		*KA*32 *KD*32 *KE*32 *KA*36 *KD*36 *KE*36	0.36% or below(7)	10*mm* or over (8)	
	Repairing of welded bead								30*mm* or over	
Preheating in working	Temperature need preheating (9)	*KA* *KB* *KD* *KE*	-5℃ or below	*KA*32 *KD*32 *KE*32 *KA*36 *KD*36 *KE*36	5℃ or below (10) (12)		*KA*32 *KD*32 *KE*32 *KA*36 *KD*36 *KE*36	0.36% or below(7)	0℃ or below (10)	
	Preheating temperature		20℃ or over		50℃ or over				20℃ or over	
Line heating (Thermal fairing)	Maximum heating temperature of steel Surface	*KA* *KB* *KD* *KE*	(11)	*KA*32 *KD*32 *KE*32 *KA*36 *KD*36 *KE*36	Water cooling just after heating	650℃ or below	*KA*32 *KD*32 *KA*36 *KD*36	0.38% or below	Water cooling just after heating	1,000℃ or below
					Air cooling after heating	900℃ or below			Air cooling after heating	
					Air cooling and subsequent water cooling after heating	900℃ or below (Starting temperature of water cooling is to be 500℃ or below)	*KE*32 *KE*36	0.38% or below	Water cooling just after heating is to be 500℃ or below	900℃ or below
									Air cooling after heating	

Notes:

(1) In *KA*40, *KD*40 ~~and~~, *KE*40 and *KE*47, the control standards for the conventional high tensile steels are applied except for the case specially approved by the Society. *KF*32, *KF*36 and *KF*40 are to be as deemed to appropriate by the Society.

(2) The conventional type is the high tensile steel of which grades of heat treatment specified in **Notes (3)** of **Table K3.3**, as other than the *TMCP* type.

(3) C_{eq} is to be calculated by the following formula and is to be rounded to two decimal places.

$$C_{eq} = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15} \ (\%)$$

(4) The control standards when the value of C_{eq} exceeds the value in this Table, in principle, are to be applied as conventional type.

(5) When there are differences in C_{eq} of the steel materials, the control standard corresponding to the higher value of C_{eq} is to be applied.

(6) The length of bead is to be measured from the starting point of weld to the centre of the crater at the termination of the weld.

(7) Where cold cracking susceptibility P_{cm} is substituted for C_{eq}, the control standards are to be as deemed to appropriate by the Society. P_{cm} is to be calculated by the following formula and is to be rounded to two decimal places.

$$P_{cm} = C + \frac{Si}{30} + \frac{Mn}{20} + \frac{Cu}{20} + \frac{Ni}{60} + \frac{Cr}{20} + \frac{Mo}{15} + \frac{V}{10} + 5B \ \ (\%)$$

(8) It is recommended that for *KE*32 and *KE*36 to be not less than 30*mm*.

(9) Even in cases where the temperature exceeds the value given in this Table, preheating may be required depending on the thickness of steel materials, degree of restrain and welding heat input.

(10) Electrodes are to be of the low hydrogen electrodes. However, in horizontal butt welding, overhead fillet welding, etc., extremely low hydrogen electrodes (the quantity of hydrogen measured by the glycerine replacement method is not more than 0.03 cm^3/g) is to be used, or in cases the temperature exceeds the value in this Table. Preheating is to be carried out.

(11) It is recommended that the conventional control standards for the conventional high tensile steels are applied to *KE*.

(12) For *KE*47, in the cases where P_{cm} is less than or equal to 0.19, 25*mm* of short bead length and air temperature of 0°C or below may be adopted where approved by the Society.

M4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

M4.2 Tests for Butt Welded Joints

M4.2.7 Impact Tests

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 (°C)	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			
<u>*KE*47</u>	<u>-20</u>	<u>64</u>		

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

Annex M1.4.2-3(1) GUIDANCE FOR NON-DESTRUCTIVE INSPECTIONS ON INTERNAL IMPERFECTIONS OF THE WELDED JOINTS OF HULL CONSTRUCTIONS

1.1 GENERAL

1.1.1 Application

Sub-paragraph -2 has been amended as follows.

1 This guidance applies to the non-destructive inspections for the internal imperfections of the butt welded joints of hull constructions.
2 The members and positions subjected to inspections are to comply with the requirements in **1.2.3** and **1.2.4**.
3 Non-destructive inspection not specified in this guidance may be used based on this guidance after the Society confirms and approves that the defect identifying capability and record performance are equal to those of radiographic testing.

1.1.2 Means of Non-destructive Inspection

Sub-paragraph -3 has been added as follows.

1 Non-destructive inspection for the internal imperfection of the welded joints of hull constructions is, in principle, to be radiographic testing.
2 Ultrasonic testing may be used in lieu of radiographic testing, in case that a manufacturer submitting ultrasonic testing specifications containing information on the items mentioned below and obtaining the approval of the Society has applied ultrasonic testing for 1/10 of welds to be subject to radiographic testing of at least three ships and is approved by the Society for the consistence.

(1) Type of ultrasonic detector and kind of probe (nominal frequency and material, dimension, type and nominal angle of refraction of transducer), and the applicable range of the testing (thickness, welding process, etc.)
(2) Calibration block and reference block for calibration
(3) Kind of ultrasonic test process (Angle beam technique is to be of standard one), and extent of the measurements and method for sensitivity adjustment for the process
(4) Judgement criteria for ultrasonic test (The criteria for angle beam technique test is to be in accordance with the requirements specified in **1.3.4**. For the other kind of ultrasonic test process, judgement criteria are to be described in detail.)
(5) Record of the results of ultrasonic test
(6) List of operators and judges

3 In cases where non-destructive inspections are to be carried out for container carrier specified in **32.10**, **Part C of the Rules**, enhanced non-destructive testing method particularly Time-of-flight diffraction (*TOFD*) technique may be applied instead of the inspections specified in **-1** and **-2** above. In such cases, documents related to the manner of assessment (including criteria for determining, technical justification for the criteria as well as requirements related to inspector qualifications, etc.) are to be submitted to and approved by the Society in advance.

1.1.3 Non-destructive Inspection Plan

Sub-paragraph -1(6) has been added as follows.

1 Prior to welding works, the manufacturer is to submit the non-destructive inspection plan containing information and data listed below and to obtain the approval of the Society.

(1) The distribution and total number of inspections specified in **Table 1.2.3-1**

(2) Welding process, number of inspections excluding intersections of welds and non-destructive inspection process for each block joints (butt joints and seam joints)

(3) The number of inspections and non-destructive inspection process for each butt weld joint in intersections of welds

(4) Block plans (This means the plans to show the block name and the block joints) containing the number of inspections specified in preceding **(2)** and **(3)**

(5) Welding process, number of inspections and non-destructive inspection processes in the places specified in **1.2.3-3**.

(6) The locations specified in **1.2.4** for container carriers applying extremely thick steel plates subject to **32.10**, **Part C of the Rules**.

1.2 Practice of Non-destructive Inspection

Paragraph 1.2.2 has been amended as follows.

1.2.2 Range of Application

1 In ships of 30*m* or over in length, the inspections are to be carried out for the block joints of structural members welded ~~on the berth and the land~~ in the dry dock, on the slipway or at any other assembly space as shown in **Table 1.2.3-1**.

2 In ships of less than 30*m* in length, the range of the inspection, the members to be inspected and the number of photographs are to be determined by the Surveyor based on consultation with the manufacturer.

3 For container carriers applying extremely thick steel plates subject to **32.10, Part C of the Rules**, in addition to the inspections specified in **-1** above, any block joints welded in the dry dock, on the slipway or at any other assembly space for the structural members specified in **1.2.4** are to also be inspected.

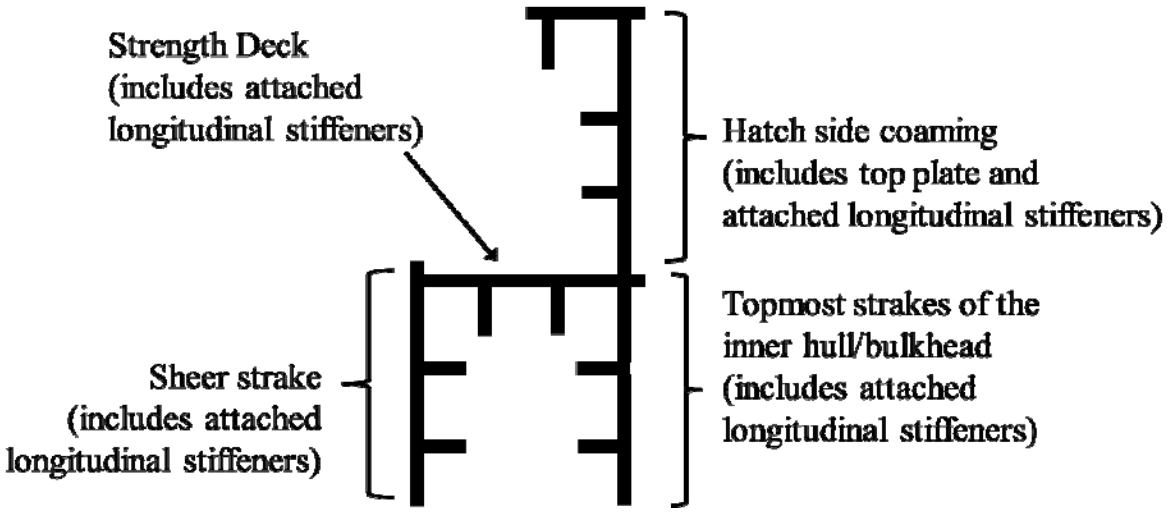
Paragraph 1.2.4 has been added as follows.

1.2.4 Special requirements for container carriers applying extremely thick steel plates

Ultrasonic testing is to be carried out on all block-to-block butt joints of all upper flange longitudinal structural members in the cargo hold region of container carriers applying extremely thick steel plates which complies with **32.10, Part C of the Rules**. Upper flange longitudinal structural members include the topmost strakes of the inner hull/bulkhead, the sheer strake, strength deck, hatch side coaming plate, coaming top plate, and all attached longitudinal stiffeners. These members are shown in **Fig. 1.2.3**.

Fig. 1.2.3 has been added as follows.

Fig. 1.2.3 Members in container carriers subject to additional non-destructive inspections



EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 January 2014.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.