# RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

## Part M Welding

**2010 AMENDMENT NO.2**

Rule No.83 15th October 2010

Resolved by Technical Committee on 6th July 2010

Approved by Board of Directors on 27th July 2010

Rule No.83 15th October 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

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*<br>*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, *KL3N*32, *KL5N*43 | | | | | 5 <*A*,*B*,*C*,*D*,*E*>(8) | | — | |
| | *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 | | | | |
| Quenched and tempered high tensile rolled steel for structure | *KA*420, *KD*420, *KE*420, *KF*420, *KA*460, *KD*460, *KE*460, *KF*460, *KA*500, *KD*500, *KE*500, *KF*500, *KA*550, *KD*550, *KE*550, *KF*550, *KA*620, *KD*620, *KE*620, *KF*620, *KA*690, *KD*690, *KE*690, *KF*690 | | | | 4(5) | 3～8<*a*,*b*,*c*,*d*,*e* >(7) | | 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) 5383*P*, 5383*S*(12), 5059*P*, 5059*S*(12), 5456*P* | | | 4(5) | — | | | |
| | 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)** 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, 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.

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 | Maximum radius of plunger (*mm*)(1) | Bending angle (*degree*) |
|---|---|---|---|
| Steel pipes for low temperature service | *KLP*9 | ~~$10t/3$~~<br>$\frac{10}{3}a$ | 180 |
| High strength quenched and tempered rolled steel plates for structure | *KA*420, *KD*420, *KE*420, *KF*420, *KA*460, *KD*460, *KE*460, *KF*460, *KA*500,*KD*500, *KE*500, *KF*500 | ~~$5t/2$~~<br>$\frac{5}{2}a$ | |
| | *KA*550, *KD*550, *KE*550, *KF*550, *KA*620, *KD*620, *KE*620, *KF*620, *KA*690, *KD*690, *KE*690, *KF*690 | ~~3t~~<br>3*a* | |
| Aluminium alloys (2) | ~~5754*P*~~ | ~~$3t/2$~~ | |
| | ~~5086*P*, 5086*S*~~ (3)<br>~~5083*P*, 5083*S*~~ (3) | ~~3t~~ | |
| | ~~6005*AS*~~ (4)<br>~~6061*P*, 6061*S*~~ (4)<br>~~6082*S*~~ (4) | ~~$7t/2$~~ | |
| | 5754*P*<br>5086*P*, 5086*S* (3)<br>5083*P*, 5083*S* (3)<br>5383*P*, 5383*S* (3)<br>5059*P*, 5059*S* (3)<br>5456*P*<br>6005*AS* (4)<br>6061*P*, 6061*S* (4)<br>6082*S* (4) | $\left(\frac{100\times a}{A}-a\right)\times 0.5$ | |
| Other materials | | ~~2t~~<br>2*a* | |

Notes:

(1) ~~*t*: thickness of the test specimen (*mm*)~~
*a*: thickness of the test specimen specified in **Table M3.2(a)** (*mm*)
*A*: minimum elongation specified in **Table K8.3** (%) and in the case of a combination of different alloys, the lowest individual value is to be used.

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

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

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

## EFFECTIVE DATE AND APPLICATION

**1.** The effective date of the amendments is 15 April 2011.

**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 and after the effective date.

# GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

## Part M Welding

GUIDANCE

**2010 AMENDMENT NO.2**

Notice No.94 15th October 2010
Resolved by Technical Committee on 6th July 2010

Notice No.94 15th October 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 WELDINGS

Amendment 2-1

## M1 GENERAL

### M1.4 Inspection and Quality for Weld

### M1.4.2 Quality and Repair

Sub-paragraphs -2 and -3 have been amended as follows.

**2** In visual inspection of welded joints specified in **1.4.2-1(2)**, **Part M of the Rules**, the Surveyor may require magnetic particle examination or liquid penetrant examination where deemed necessary. In such cases, the magnetic particle examination and liquid penetrant examination for the welded joints of the hull structures of steel ships are to be in accordance with **Annex M1.4.2-2** "GUIDANCE FOR NON-DESTRUCTIVE INSPECTIONS ON SURFACE IMPERFECTIONS OF THE WELDED JOINTS OF HULL CONSTRUCTIONS".

**3** In non-destructive inspection of welded joints specified in **1.4.2-1(3)**, **Part M of the Rules**, "non-destructive inspection which is separately specified by the Society" means the followings.

(1) For the welded joints of hull structure of steel ships, non-destructive inspection is to be carried out in accordance with the requirements specified in **Annex M1.4.2-3(1)** "GUIDANCE FOR NON-DESTRUCTIVE INSPECTIONS ON INTERNAL IMPERFECTIONS OF THE WELDED JOINTS OF HULL CONSTRUCTIONS".

(2) For the welded joints of machinery, piping and tanks of liquefied gas carrier, non-destructive inspection is to be in accordance with the relevant requirements in the Rules.

(3) For the welded joints of hull construction of aluminium alloy, welded joints of equipment or welded joints of connection between hull structure and equipment, non-destructive inspection is to be deemed appropriate by the Surveyor.

# M2 WELDING WORKS

## M2.4 Welding Process

Paragraph M2.4.1 has been amended as follows.

### M2.4.1 Selection of Welding Consumables

**1** "It is deemed to be appropriate by the Society" specified in **2.4.1(2)(c)**, **Part M of the Rules** is, in principle, to be as provided below:

(1) The steel materials are to be in accordance with the followings:
   (a) The steel materials are to be *KA*32, *KD*32, *KA*36 or *KD*36 of *TMCP* not exceeding 25*mm* in thickness.
   (b) The carbon equivalent ($C_{eq}$) of steel materials is to be calculated in accordance with **Note (3)** of **Table M2.4.3-1** and to be not more than 0.36%.

(2) The welding method is to be one pass horizontal fillet welding either by manual welding or gravity welding, and to have been approved by the Society in accordance with the requirements in **M4.3.1**.

(3) Approval is to have been obtained form the Society for electrodes as being the non-low hydrogen electrodes for high tensile steel in accordance with the requirements in **M6.2.1**.

(4) Notwithstanding the requirement in preceding **(3)**, low hydrogen electrodes are to be used for repair welding.

**2** Backing flux used for submerged arc one side automatic welding is not included in the backing specified in **2.4.1-2**, **Part M of the Rules**

Annex M1.4.2-2 has been added as follows.

## Annex M1.4.2-2 GUIDANCE FOR NON-DESTRUCTIVE INSPECTIONS ON SURFACE IMPERFECTIONS OF THE WELDED JOINTS OF HULL CONSTRUCTIONS

### 1.1 GENERAL

#### 1.1.1 Application

**1** This guidance applies in cases where deemed necessary by the Surveyor.

**2** This guidance applies to the non-destructive inspections of the surface imperfections of the butt welded joints and the fillet welded joints of hull constructions.

**3** The members and positions subjected to inspections are to be to the extent deemed necessary by the Surveyors.

#### 1.1.2 Means of Non-destructive Inspection

The non-destructive inspections of the surface imperfection of the welded joints of hull constructions are to be magnetic particle examination or liquid penetrant examination.

#### 1.1.3 Presence of Non-destructive Inspection

A Surveyor is, in principle, to be present during the test.

### 1.2 Practice of Non-destructive Inspection

#### 1.2.1 Non-destructive Inspection Procedures, Operator's Qualification, etc.

**1** Non-destructive inspection procedures:

(1) Magnetic particle examination is to conform to *ISO* 9934-1(2001), *ISO* 9934-2(2002), *ISO* 9934-3(2002), *JIS Z* 2320-1(2007), *JIS Z* 2320-2(2007), *JIS Z* 2320-3(2007) or the equivalent thereto.

(2) Liquid penetrant examination is to conform to *ISO* 3452-1(2008), *ISO* 3452-2(2006), *ISO* 3452-3(1998), *ISO* 3452-4(1998), *JIS Z* 2343-1(2001), *JIS Z* 2343-2(2009), *JIS Z* 2343-3(2001), *JIS Z* 2343-4(2001) or the equivalent thereto.

**1** Qualification of Operator

**2** Qualification of Operator

Operators are to have Level 2 qualification or above, and such qualifications are to be certified by a certification body deemed appropriate by the Society, e.g. The Japanese Society for Non-destructive Inspection, in accordance with ISO 9712(2005), JIS Z 2305(2001) or the equivalent thereto. Notwithstanding the above, operators having Level 1 qualification can perform the procedures under the supervision of another operator having Level 2 qualification or above.

**3** Practice of Tests

(1) Dust or other preventives are to be removed from the surface of the welds subjected to non-destructive inspections.

(2) In magnetic particle examination, when using current flow equipment with prods, care is to be taken to avoid local damage to the material. Copper prod tips are not to be used. Prod tips are to be either lead, steel, aluminium or aluminium-copper braid. To ensure detection of

discontinuities of any orientation, welds are to be magnetized in two directions approximately perpendicular to each other with a maximum deviation of 30°. Adequate overlapping is to ensure testing of the whole zone. As far as practicable, the continuous wet particle method is to be used.

(3) In liquid penetrant examination, the temperature of parts examined is to be typically between 5°*C* and 50°*C*. In cases outside of this temperature range, special low/high temperature penetrant and reference comparator blocks are to be used. The penetration time is not to be less than 10 minutes and to be in accordance with manufacturer specifications. It is preferable that the development time be between 10-30 minutes.

**4** Records of Tests

(1) In magnetic particle examination, records which describe the inspection date, inspection spots, type of magnetization, magnetic field strength, detection media, viewing condition, demagnetization (if required), location of the defects, size of the defects and the operator and the person making the final evaluation, are to be made out.

(2) In liquid penetrant examination, records which describe the inspection date, inspection spots, type of devices used (penetrant, cleaner and developer), penetration time, development time, location of the defects, size of the defects and the operator and the person making the final evaluation are to be made out.

## 1.3 Acceptable Criteria of Non-destructive Inspections

### 1.3.1 Determination of Acceptance

The Surveyor is to decide whether or not the results are acceptable when the test records specified in **1.2.1-4** are submitted.

### 1.3.2 Acceptable Criteria of Magnetic Particle Examination and Liquid Penetrant Examination

Only those indications which have any dimension greater than 2 *mm* are to be evaluated in accordance with **Table 1.3.2**.

**Table 1.3.2 Acceptance Criteria**

| Type of defect | Acceptance Criteria |
|---|---|
| Crack | Not accepted |
| Lack of fusion | Not accepted |
| Incomplete root penetration | Not accepted |
| Surface pore | For butt welds:<br>single pore diameter $d$ ($mm$) $\leqq$ $0.25t$[(1)] with maximum diameter 3 $mm$<br>$2.5d$ as minimum distance to adjacent pore<br><br>For fillet welds:<br>single pore diameter $d$ ($mm$) $\leqq$ $0.25a$[(1)] with maximum diameter 3 $mm$<br>$2.5d$ as minimum distance to adjacent pore |
| Undercut | For butt welds:<br>depth $\leqq$ 0.8 $mm$ whatever in the length<br>depth $\leqq$ 0.5 $mm$ with a maximum continuous[(2)] length of 90 $mm$<br><br>For fillet welds:<br>depth $\leqq$ 0.8 $mm$ whatever in the length |

Note:

(1) $t$: Plate thickness of the thinnest plate（$mm$）
$a$: Throat of the fillet weld（$mm$）

(2) Adjacent undercuts separated by a distance shorter than the shortest undercut are to be regarded as a single continuous undercut.

## 1.4 Repair of Faulty Welds, etc.

### 1.4.1 General

Repairs are to be carried out after the Surveyor's judgement specified in **1.3.1**.

### 1.4.2 Repair and Treatment after the Repair

If a part is judged unacceptable according to the requirement specified in **1.3.1**, the faulty welds are to be repaired properly.

Title of Annex M1.4.2-3(1) has been amended as follows.

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

### 1.1 GENERAL

Paragraph 1.1.1 has been amended as follows.

#### 1.1.1 Application

**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**.

~~**2**~~**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 -1 has been amended as follows.

**1** Non-destructive inspection for the internal imperfection of the welded joints of hull constructions is, in principle, to be radiographic testing.

### 1.2 Practice of Non-destructive Inspection

#### 1.2.1 Non-destructive inspection procedure, Operator's Qualification, etc.

Sub-paragraphs -1 and -2 have been amended as follow.

**1** Non-destructive inspection procedure

(1) Radiographic testing is to conform to *ISO* ~~1106/1(1984), *ISO* 1106/2(1985)~~17636(2003), ~~*ISO* 5579(1984) and~~ *JIS Z* 3104(1995) or equivalent thereto.

(2) Ultrasonic testing is to conform to *JIS Z* 3060(1994) or equivalent thereto.

**2** Qualification of Operator

~~A qualification of operator engaging in non-destructive testing is to be of non-destructive test Level I or above certified by the Japan Association of Non-destructive Testing or in *ISO* 9712 or equivalent thereto. Notwithstanding, the operator qualified for the non-destructive test Level I can engage in the testing under supervision of those qualified for non-destructive testing Level II or above.~~

Operators are to have Level 2 qualification or above, and such qualifications are to be certified by a certification body deemed appropriate by the Society, e.g. The Japanese Society for

Non-destructive Inspection, in accordance with *ISO* 9712(2005), *JIS Z* 2305(2001) or the equivalent thereto. Notwithstanding the above, operators having Level 1 qualification can perform the procedures under the supervision of another operator having Level 2 qualification or above.

### 1.3 Acceptable Criteria of Non-destructive Inspections

#### 1.3.2 Classification of Defects

Sub-paragraph -1 has been amended as follows.

**1** General

(1) ~~Qualification of judges is to be of non-destructive test Level II or above certified by the Japan Association of Non-destructive Testing, or in *ISO* 9712 or equivalent thereto.~~
Judges are to have Level 2 qualification or above, and such qualifications are to be certified by a certification body deemed appropriate by the Society, e.g. The Japanese Society for Non-destructive Inspection, in accordance with *ISO* 9712(2005), *JIS Z* 2305(2001) or the equivalent thereto.

(2) In case of butt welded joints between plates with different thickness, thickness of the thinner plate is taken.

EFFECTIVE DATE AND APPLICATION (Amendment 2-1)

**1.** The effective date of the amendments is 15 October 2010.

Amendment 2-2

# M2 WELDING WORKS

## M2.1 General

Table M2.1.1-2 has been amended as follows.

**Table M2.1.1-2 Application of Welding Consumables (Aluminium Alloys)**

| Kind and grade of aluminium alloy to be welded | | Grade of applicable welding consumables (1) |
|---|---|---|
| 5000 series | 5754*P* | *RA/WA*, *RB/WB*, *RC/WC* |
| | 5086*P*, 5086*S* | *RB/WB*, *RC/WC* |
| | 5083*P*, 5083*S* | *RC/WC* |
| | 5383*P*, 5383*S* | *RC/WC* |
| | 5059*P*, 5059*S* | *RC/WC* |
| | 5456*P* | *RC/WC* |
| 6000 series | 6005*AS* | *RD/WD* |
| | 6061*P*, 6061*S* | *RD/WD* |
| | 6082*S* | *RD/WD* |

Note:

(1) The symbols used for the welding consumables in this Table are the last two characters used for the same materials shown in **Table M6.51**.

# M4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

## M4.1 General

### M4.1.4 Range of Approval

Sub-paragraph -5(2) has been amended as follows.

(2) Aluminium Alloys
The requirements specified in the following **(a)** thorough ~~**(g)**~~ **(h)** are to be applied.

(a) Type of welded joints
Type of welded joints is to be as specified in **Table M4.1.4-3**. 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 M4.1.4-4**.

(c) Throat thickness of fillet welds
Throat thickness of fillet welds is to be as specified in **Table M4.1.4-5**.

(d) Kind of aluminium alloys
Kind of aluminium alloys is to be as specified in **Table M4.1.4-6**.

(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 **-4(2)** is to be applied.

(g) Post-weld heat treatment or ageing
The heat treatment or ageing used in the qualification test is to be maintained during actual work. However, prolonged natural ageing may be used as the artificial ageing for 6000 series alloys.

(~~g~~ h) 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 M4.1.4-3 has been amended as follows.

**Table M4.1.4-3 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 | A, C, D |
| Fillet welding | | | E | E |

Table M4.1.4-4 has been amended as follows.

**Table M4.1.4-4 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.~~ | | | |

| Thickness of test assembly $t$ (mm)[1] | Range of approval |
|---|---|
| $t \leqq 3$ | 0.5mm to $2t$[2] |
| $3 < t \leqq 20$ | 3mm to $2t$[2] |
| $t > 20$ | $0.8t$[2] and above |

Notes:

(1) In case of joints between dissimilar thicknesses, 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)~~ (h)**).

Table M4.1.4-5 has been amended as follows.

**Table M4.1.4-5 Throat Thickness of Fillet Welds**

| Throat thickness of test assembly $\ell$ (mm) | Range of approval |
|---|---|
| $\ell < 10$ | ~~1.5 $\ell$ max. (max. 10mm)~~ 0.75 $\ell$ to 1.5 $\ell$ |
| $10 \leq \ell$ | ~~$\ell$~~ 7.5mm and above |

Table M4.1.4-6 has been amended as follows.

**Table M4.1.4-6 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)~~<br>~~(A+B1), (A+B2), (B1+B2)~~ |
| | ~~6000 series~~ | ~~6005*AS*~~<br>~~6061*P*, 6061*S*~~<br>~~6082*S*~~ | ~~C~~ | ~~(C+C)~~ |

| Grade of test assembly | | | Material classification | Range of approval(2), (3) |
|---|---|---|---|---|
| Aluminium alloys(1) | 5000 series | 5754*P* | A | (A+A) |
| | | 5086*P*, 5086*S*,<br>5083*P*, 5083*S*,<br>5383*P*, 5383*S*,<br>5059*P*, 5059*S*,<br>5456*P* | B | (A+A), (B+B), (A+B) |
| | 6000 series | 6005*AS*<br>6061*P*, 6061*S*<br>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.

(3) The qualification of one alloy also qualifies the procedures for other alloys of the same material classification which have an equal or lower specified tensile strength after welding.

## M4.2 Tests for Butt Welded Joints

Paragraph M4.2.2 has been added as follows.

**M4.2.2 Kinds of Test**

As for the welding of aluminium alloys, imperfections detected by visual or non-destructive testing are to be assessed in accordance with *ISO* 10042(2005), Level *B*, except for excess weld metal or convexity, excess throat thickness and excess of penetration for which Level *C* applies.

## M4.3 Tests for Fillet Welded Joints

Paragraph M4.3.2 has been added as follows.

**M4.3.2 Kinds of Test**

As for welding of aluminium alloys, imperfections detected by visual or non-destructive testing shall be assessed in accordance with *ISO* 10042(2005), Level *B*, except for excess weld metal or convexity, excess throat thickness and excess of penetration for which Level *C* applies.

EFFECTIVE DATE AND APPLICATION (Amendment 2-2)

**1.** The effective date of the amendments is 15 April 2011.

**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 and after the effective date.