RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part M Welding

2021 AMENDMENT NO.1

Rule No.29 30 June 2021

Resolved by Technical Committee on 27 January 2021

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

Rule No.29 30 June 2021
AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

"Rules for the survey and construction of steel ships" has been partly amended as follows:

Part M WELDING

Amendment 1-1

Chapter 3 TEST SPECIMENS AND MECHANICAL TESTING PROCEDURES

3.2 Test Specimens

3.2.2 Tensile Test Specimens

1 Tensile test specimens are to be of size and dimensions given **Table M3.1**, and the both ends of the test specimen may be machined to such a shape as to fit the holder of the testing machine.

2 The upper and lower surfaces of weld are to be filed, ground or machined flush with the surface of plate.

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

3.2.3 Bend Test Specimens

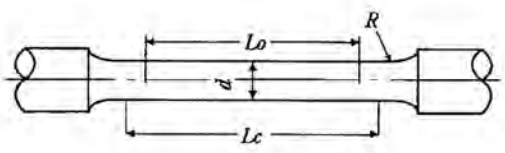
1 Bend test specimens are to be of size and dimensions given in **Table M3.2** and **Table M3.3** according to the kind of test assembly.

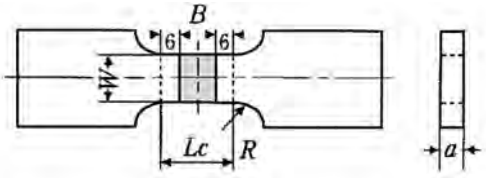
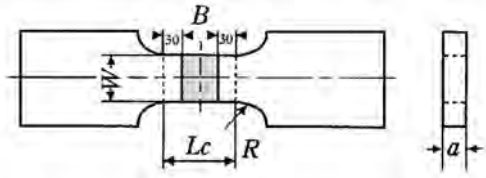
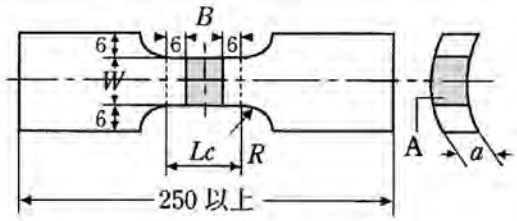
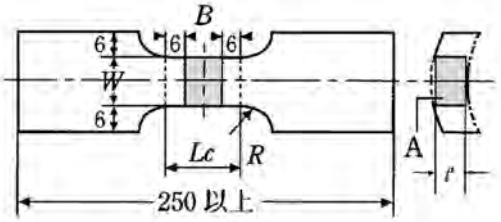
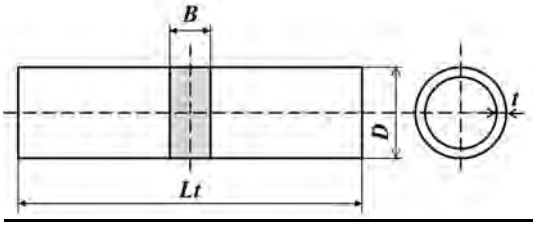
2 Where the thickness of test assemblies is greater than the thickness of the bend test specimen prescribed in **Table M3.2**, the face bend or root bend specimen may be machined on its compression side to the specified thickness.

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

Table M3.1 has been amended as follows.

Table M3.1 Size and Dimension of Tensile Test Specimens (*mm*)

Kind	Size of specimens		Dimensions(1)	Intended for
*U*1*A*	Deposited metal tensile test specimen		As a rule d = 10 Lo = 50 Lc = 60 $R \geq 10$	Deposited metal tensile test (Longitudinal tensile test)
1*B*			d = 6.0 Lo = 24 Lc = 32 $R \geq 6$	Deposited metal test: t = 12 (Welding consumables for stainless steel)
1*C*			d = 12.5 Lo = 50 Lc = 60 $R \geq 15$	Deposited metal test: $19 \leq t \leq 25$ (Welding consumables for stainless steel)

U2A	Butt weld tensile test specimen		$a = t$ (2) $W = 30$ $Lc = B + 12$ $R \geq 50$	Butt weld tensile test for plate
U2B			$a = t$ (2) $W = 12$ ($t \leq 2$) $W = 25$ ($t > 2$) $Lc = B + 60$ $R \geq 25$	
2*C*(3)			$a = t$ $W = 6$ ($D < 50$) $W = 20$ ($D \geq 50$) $Lc = B + 12$ $R \geq 50$ The sectional area of *A* is to be considered to be $W \times a$	Butt weld test for pipe: $t < 9$
2*D*(3)			$a = t'$ (2) $W = 6$ ($D < 50$) $W = 20$ ($D \geq 50$) $Lc = B + 12$ $R \geq 50$ The sectional area of *A* ~~shall~~ is to be finished to be rectangular. However, the machining allowance ~~shall~~ is to be minimum.	Butt weld test for pipe: $t \geq 9$
2 *E*(4)			$D < 50$ $Lt \geq 10 \times D$	Butt weld test for pipe: $D < 50$

Notes:

(1) The following designations are used.
d : diameter, *a* : thickness, *W* : width, *Lo* : gauge length, *Lc* : parallel part length, *Lt* : length of test assembly, *R* : transition radius,
B : breadth of weld, *t* : thickness of test assembly, *t'* : thickness of hobbed test assembly,
D : outside diameter of the pipe.

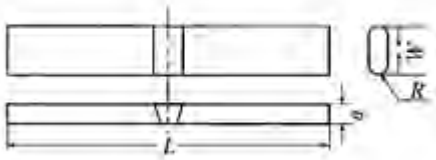
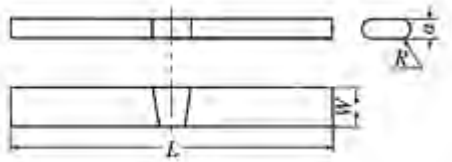
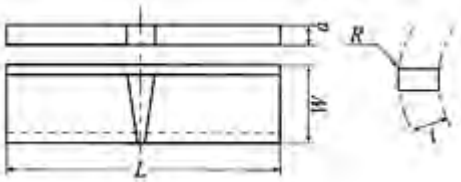
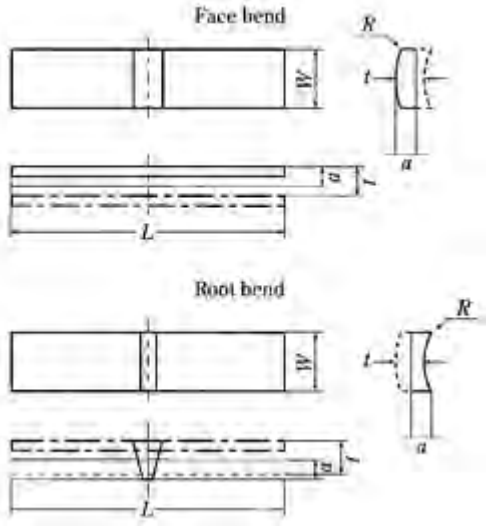
(2) When the thickness of the test piece is so large that it exceeds the capacity of the testing machine, the test piece may be divided to be tested.

(3) In the case of $D < 50$, test specimen 2*E* may be used instead of test specimens 2*C* and 2*D*.

(4) The method of attaching the test assembly is to be in accordance with the provisions of *JIS Z* 3121 for test specimen 2.

Table M3.2 has been amended as follows.

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

Kind	Used for		Size of specimen	Dimensions	Intended for
UB-1	Welding procedure qualification tests	Face and root bend specimen		$a = t$ $W = 30$ $L \geq 200$ $R \geq 1 \sim 2$	Test assemblies for butt weld test for plate:
UB-2		Side bend specimen		$a = 10$ $W = t$ (2) $L \geq 200$ $R \geq 1 \sim 2$	Test assemblies for butt weld test for plate: $t \geq 12$
B-3				$a = 10$ $W = t$ (2) $L \fallingdotseq 200$ $R \leq 1.5$	Test assemblies for butt weld test for pipe: t ~~≥~~ <u>≥</u> 12
B-4		Face and root bend specimen		$a = t$ $W = 19$ $L \fallingdotseq 200$ $R \leq 1.5$ For the tube whose D is 34.0 to 60.6, W ~~shall~~ <u>is to</u> be 10. For the tube having D of 34.0 and under, the width obtained by dividing the tube longitudinally into four equal parts ~~shall~~ <u>is to</u> be the width of the test piece. <u>In case of $D \leq$ 34.0, the flattening of the inner and outer surfaces of the tube may be omitted by simply removing excessive convexity.</u>	Test assemblies for butt weld test for pipe: $t < 10$
B-5				$a = 10$ $W = 40$ $L \fallingdotseq 200$ $R \leq 1.5$ For the tube having a D of 114.3 and under, W ~~shall~~ <u>is to</u> be 19.	Test assemblies for butt weld test for pipe: $t \geq 10$

(Omitted)

Notes:

(1) The following designations are used:
a : thickness, *W* : width, *R* : edge radius, *D* : external tube diameter
t : thickness of test assembly, *B* : breadth of weld, *L* : length

(2) Where the thickness of the side bend specimen exceeds 40 *mm*, the test specimen may be divided to be tested.

Chapter 4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

4.2 Tests for Butt Welded Joints

4.2.5 Tensile Tests*

Sub-paragraph -1 has been amended as follows.

1 Tensile tests are to be carried out with the *U*2*A*, *U*2*B*, 2*C* ~~and~~, 2*D* or *2E* test specimens shown in **Table M3.1**. However, where other test specimens are used, they are to be approved by the Society. The ultimate tensile strength is not to be less than the minimum ultimate tensile strength specified for the base metal except for those specified in **Table M4.7**.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2021.

2. Notwithstanding the amendments to the Rules, the current requirements apply to tensile tests and bend tests for the butt welds of pipes conducted before the effective date.

Amendment 1-2

Chapter 4 WELDING PROCEDURE AND RELATED SPECIFICATIONS

4.2 Tests for Butt Welded Joints

4.2.5 Tensile Tests*

Table M4.7 has been amended as follows.

Table M4.7 Tensile Test Requirements for Butt Welded Joint

Kind of test assembly	Grade of test assembly	Tensile test	
		Tensile strength (N/mm^2)	0.2% proof stress(N/mm^2)
Rolled steels for low temperature service	*KL9N53*, *KL9N60*	590 min. (1)	315 min.
		630 min. (2)	—
Steel pipes for low temperature service	*KLP9*	630 min.	—
Aluminium alloys (3)	5086*P*-*H*112 (4)	240 min.	—
	5086*P*-*H*116		
	5083*P*-*H*116	275 min.	—
	5083*P*-*H*321		
	5383*P*-*H*116	290 min.	—
	5383*P*-*H*321		
	5456*P*-*H*116 (6)		—
	5456*P*-*H*321 (6)		
	5059*P*-*H*116	330 min.	—
	5059*P*-*H*321		
	5086*S*-*H*111	240 min.	—
	5383*S*-*H*112	290 min.	—
	6061*P*-*T*6	170 min.	—
	6005*AS*-*T*5 (5), 6005*AS*-*T*6 (5)		
	6061*S*-*T*6 (5)		
	6082*S*-*T*5 (5), 6082*S*-*T*6 (5)		

Notes:

(1) For test specimens in longitudinal direction

(2) For test specimen in transverse direction

(3) Grades of aluminium alloys have indication grade showing the temper condition.

(4) For test assembly thickness not more than 12.5 *mm*

(5) See **Notes (13)** of **Table M4.6**.

(6) When the thickness is 40 *mm* or less.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 30 June 2021.

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

Amendment 1-3

Chapter 1 GENERAL

1.2 Tests before Welding Works

1.2.1 Execution of Tests

Sub-paragraph -1 has been amended as follows.

1 The welding procedure, the welder's qualifications and the welding consumables specified in this Part are to be subjected to the required tests in the presence of the Surveyor and to be approved by the Society before welding works. To implement the tests, in lieu of traditional ordinary surveys where the Surveyor is in attendance, the Society may approve other survey methods which it considers to be appropriate.

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

1. The effective date of the amendments is 1 July 2021.

Amendment 1-4

Chapter 1 GENERAL

1.4 Inspection and Quality for Weld

1.4.2 Quality and Repair*

Sub-paragraph -1(3) has been amended as follows.

1 The quality of weld is to be assured in accordance with the requirements provided below.

(1) Inspection during welding works
Inspection items during welding works, which are designated by the Surveyor taking account of the result of confirmation of welding work conditions specified in **1.3.2**, are to be observed in good order.

(2) Visual inspection of weld
Visual inspection of weld is to be carried out. The weld is to be free from weld cracks, excess weld metal or excessive convexity and surface harmful imperfections, such as undercuts, overlaps, etc., and excessive misalignment and deformation. The size of fillet welds is to comply with the requirements specified in **1.2.3**, **Part C**.

(3) Non-destructive inspection of weld
Non-destructive inspection of weld ~~which is separately specified by the Society~~ is to be carried out in accordance with **Chapter 8**. The weld is to be free from weld cracks and internal harmful imperfections such as lack of fusion and penetration, etc.

Chapter 8 has been added as follows.

Chapter 8 NON-DESTRUCTIVE INSPECTION FOR THE WELDED JOINTS OF HULL CONSTRUCTIONS

8.1 General

8.1.1 General*

1 Non-destructive test is normally to be performed by the shipbuilder or its subcontractors in accordance with this chapter.

2 It is the shipbuilder's responsibility to assure that testing specifications and procedures are adhered to during the construction and that relevant reports are made available to the Society on the findings made by non-destructive test.

3 Members subject to inspections, the locations of inspections and the number of inspections are to be as deemed appropriate by the Society.

8.1.2 Application*

1 This chapter applies to the non-destructive inspections for the welded joints of hull constructions during new building. The details of the base metals, welding procedures and welded joints to be subject to the requirements of this chapter are as follows.

(1) Base metals

This chapter applies to the following types of base metals: the rolled steels for hulls specified in **3.1**, **3.10** and **3.12**, **Part K of the Rules**; the rolled steels for low temperature service specified in **3.4**, **Part K of the Rules**; the rolled stainless steels specified in **3.5**, **Part K of the Rules**; the high strength rolled steels for offshore structures specified in **3.8**, **Part K of the Rules**; the steel castings specified in **5.1**, **Part K of the Rules**; and the steel forgings specified in **6.1**, **Part K of the Rules**.

(2) Welding procedures

This chapter applies to the following welding procedures: manual metal arc welding, metal arc welding (including flux cored wire arc welding), *TIG* welding, submerged arc welding, electro-slag welding and electro-gas welding.

(3) Welded joints

This chapter applies to the following types of welded joints: butt welded joints with full penetration, *T*-joints, corner and cruciform joints with or without full penetration, and fillet welds.

2 Base metals, welding procedures and welded joints other than those specified in the preceding **-1** are to be deemed appropriate by the Society.

3 Advanced non-destructive testing is to be in accordance with **Chapter 9**.

4 Non-destructive inspections for internal imperfections of the welded joints of hull constructions are, in principle, to be radiographic testing.

5 In cases where the following **(1)** and **(2)** are fulfilled, ultrasonic testing may be used in lieu of radiographic testing.

(1) Non-destructive inspection specifications comply with *ISO* 17640 or other standards deemed appropriate by the Society are approved by the Society.

(2) Non-destructive inspection specifications apply to ultrasonic testing for 1/10 of welds to be subject to radiographic testing of at least 3 ships and their consistent application is approved by the Society in advance.

8.1.3 Surveyor Presence at Non-destructive Test

1 For non-destructive test of surface imperfections, a Surveyor is, in principle, to be present

during the test.

2 For non-destructive test of internal imperfections, a Surveyor is to be present at the following times.

(1) For radiographic testing, a Surveyor is to review the records of the test for judgement.

(2) For ultrasonic testing, a Surveyor is, in principle, to be present during the test. The Surveyor is also to review the records of the test for judgement.

8.1.4 Timing of Non-destructive Test

1 Non-destructive test shall be carried out after welds have cooled to ambient temperature and after post weld heat treatment where applicable.

2 For high strength steels for welded structures with specified minimum yield stresses in the range of 420 N/mm^2 to 690 N/mm^2, non-destructive test shall not be carried out before 48 hours have passed after the completion of welding. For steels with specified minimum yield stresses greater than 690 N/mm^2, non-destructive test shall not be carried out before 72 hours have passed after the completion of welding. However, in cases where the following **(1)** and **(2)** are fulfilled, the 72-hour interval may be reduced to 48 hours for radiographic testing or ultrasonic testing.

(1) A complete visual for the entire welded joint and random magnetic particle or penetrant test for those locations indicated by the surveyor is carried out 72 hours after the welding work has been completed and the welds have cooled to the ambient temperature, and the results are to be a pass.

(2) The Surveyor determines that there is no indication of delayed cracking due to low temperatures occurring.

3 Notwithstanding the preceding **-2**, where post weld heat treatment is carried out, the requirement of the preceding **-2** may be mitigated when agreed to by the surveyor.

4 In cases where evidence of delayed cracking due to low temperatures has been observed, or in the case of high thickness welds, a longer interval or additional random inspection at a later period may be required when deemed necessary by the surveyor.

8.1.5 Application of Non-destructive Test Method

1 The methods mentioned in this chapter for the detection of surface imperfections are visual testing (*VT*), liquid penetrant testing (*PT*) and magnetic particle testing (*MT*). The methods mentioned for detection of internal imperfections are ultrasonic testing (*UT*) and radiographic testing (*RT*).

2 The locations to which non-destructive test methods may be applied are specified in **Table M8.1** according to joint type and base metal thickness.

Table M8.1 Applicable Non-destructive Test Methods for the Welded Joints

Welded joint	Thickness of base metal	Applicable test methods
Butt welded joints	≤ 8 *mm*[(1)]	*VT*, *PT*, *MT*, *RT*
	≥ 8 *mm*	*VT*, *PT*, *MT*, *UT*, *RT*
T-joints, corner joints and cruciform joints with full penetration	≤ 8 *mm*[(1)]	*VT*, *PT*, *MT*, *RT*[(3)]
	≥ 8 *mm*	*VT*, *PT*, *MT*, *UT*, *RT*[(3)]
T-joint, corner joints and cruciform joints with partial penetration, and fillet weld joints	all	*VT*, *PT*, *MT*, *UT*[(2)], *RT*[(3)]

Notes:

(1) In cases where thickness is below 8 *mm*, the Society may consider the application of an appropriate advanced ultrasonic testing method.

(2) In cases where it is deemed appropriate by the Society, ultrasonic testing may be used to check the extent of penetration for *T*-joints, and corner and cruciform joints.

(3) In cases where it is deemed appropriate by the Society, radiographic testing may be applied.

8.2 Qualification of Non-destructive Testing Personnel

8.2.1 Qualification and Certification of Non-destructive Testing Personnel

1 Supervisors and operators are to be recognised by a certification scheme based upon *ISO* 9712 or *JIS Z*2305. The aforementioned standards, in principle, refer to the most recent version published.

2 The shipbuilder or its subcontractor is to be responsible for the preceding **-1**.

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

4 Supervisor and operator certificates and competence are to appropriate for the non-destructive inspection methods being employed by the shipbuilder or its subcontractor.

8.2.2 Supervisor

1 The shipbuilders or its subcontractors are to have a supervisor or supervisors who are responsible for the appropriate execution of non-destructive test operations and for the professional standard of the operators and their equipment, including the professional administration of the working procedures.

2 Supervisors are to be certified to Level 3 by a certification body deemed appropriate by the Society (e.g. The Japanese Society for Non-destructive Inspection) based upon **8.2.1**.

3 In relation to the preceding **-2**, shipbuilders or its subcontractors are to employ, on a full-time basis, at least one supervisor for all non-destructive testing methods which are carried out by the shipbuilder or its subcontractor, except in cases where it is recognised that it is difficult for the shipbuilder or its subcontractor to directly employ a Level 3 certified supervisor for all the stated non-destructive testing methods.

4 Supervisors are to be directly involved in the review and acceptance of non-destructive inspection specifications, the making of test records and survey records, and the calibration of non-destructive testing equipment and tools.

5 Supervisors are to evaluate the competence of operators annually.

8.2.3 Operator

1 Operators, in principle, are to be certified to Level 2 by a certification body deemed appropriate by the Society (e.g. The Japanese Society for Non-destructive Inspection), based upon **8.2.1**, except in cases where the requirement of 8.2.1-3 is to be applied.

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

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

8.3 Surface Condition

8.3.1 Surface Condition

1 Location of inspections are to be free from scale, slag, loose rust, weld spatter, oil, grease, dirt, or paint that might affect the sensitivity of the testing method.

2 Preparation and cleaning of welds for subsequent non-destructive test are to be in accordance with the accepted non-destructive inspection specifications.

3 The Society may not accept result of non-destructive test to be carried out on surface that prevent proper interpretation.

8.4 General Plan of Non-destructive Inspection

8.4.1 General

1 Members subject to inspections, location of inspections and the quality level specified in *ISO* 5817 are to be planned by the shipbuilder according to ship design, ship type and welding the processes used. The aforementioned standards, in principle, refer to the most recent version published.

2 Prior to welding works, the shipbuilder is to submit the non-destructive inspection plan containing the details of the non-destructive test to be applied, the members subject to inspections, the location of inspections, the number of inspections, test length and Quality Level to the Society for approval. The Society, however, may require changes in non-destructive test to be applied, the members subject to inspections, the locations of inspections, the number of inspections, test length and Quality Level where deemed necessary even after a non-destructive inspection plan has been approved.

3 Particular attention is to be paid to inspecting welds in highly stressed areas and welds in primary and special structures.

4 Non-destructive inspection plans are to only be released to the personnel in charge of the non-destructive test and its supervision.

8.4.2 Location of Inspections*

1 In selecting the locations of inspections, emphasis is to be given to the following locations:

(1) Welds in high stressed areas
(2) Fatigue sensitive areas
(3) Field erected welds
(4) Suspected problem areas
(5) Welds which are inaccessible or very difficult to inspect in service
(6) Other important structural elements
(7) Welds for which non-destructive inspections are deemed necessary by the Surveyor

2 Block construction welds performed in yards, or at subcontracted yards or facilities are to be considered when selecting locations of inspections.

3 The result of non-destructive inspections and the locations of inspection are to be in total correspondence.

4 For welded constructions (e.g. marine and offshore structures) other than hull constructions, the locations of inspections is to be as deemed appropriate by the Society.

5 If an unacceptable level of indications is found, the number of inspections is to be increased in accordance with **8.9.2**.

8.4.3 Non-destructive Test Application Procedure*

1 All welds over their full length are to be subject to visual test by personnel designated by the shipbuilder, and such personnel may be exempted from the qualification requirements specified in **8.2**.

2 When it is deemed necessary by the Surveyor, liquid penetrant testing or magnetic particle testing is to be used when investigating the outer surface of welds, checking the intermediate weld passes and back-gouged joints prior to subsequent passes deposition.

3 For non-destructive test of surface imperfections for important *T*-joints or corner joints, liquid penetrant testing or magnetic particle testing deemed appropriate by the Society is to be carried out.

4 Welded connections between large castings (e.g. rudder horn) or forged components and rolled steels for hull are to be tested over their full length using liquid penetrant testing or magnetic particle testing, and locations deemed appropriate by the Society are to be tested using ultrasonic testing or radiographic testing.

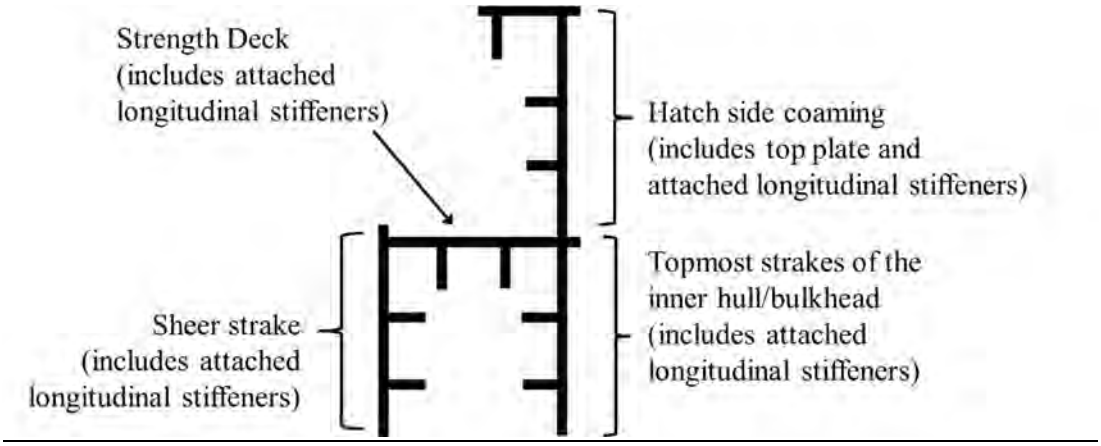
5 Non-destructive test to be applied are to be suited for the detection of particular types, orientations and dimensions of discontinuities. In addition, the non-destructive test method is to be agreed by the Society.

6 In general, start/stop points in welds made using automatic (mechanised) welding processes are to be examined using ultrasonic testing or radiographic testing, except for internal members where the omission of testing is to be agreed by the Surveyor.

7 Where the surveyor becomes aware that a location has been repaired without a record of the original defect, the shipyard is to carry out additional tests on locations adjacent to the repaired location according to the Surveyor’s instructions.

8 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 **32.13**, **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. M8.1**.

Fig. M8.1 Members in Container Carriers Subject to Additional Non-destructive Inspections



8.5 Non-destructive Testing Procedure

8.5.1 General

1 The testing method, equipment and conditions are to comply with recognized national or international standards, or other documents deemed appropriate by the Society.

2 The shipbuilder and its subcontractor is to obtain the confirmation of the Society for non-destructive inspection specifications containing sufficient details of the testing method to be applied. For non-destructive inspection specifications of ultrasonic testing, the shipbuilder or its subcontractor is to obtain approval of the Society in accordance with **8.1.2-5**.

3 Members subject to inspections, location of inspections and test length are to be in accordance with the decision of the Surveyor and the approved non-destructive inspection plans specified in **8.4**.

4 The testing volume is to be the zone which includes the weld and base metal for at least 10 *mm* on each side of the weld, or the width of the *HAZ*, whichever is greater. In all cases, the inspection is to cover the whole testing volume.

5 Where it is deemed necessary by the Surveyor, provision is to be made for the Surveyor to verify the testing method, the test records specified in **8.7**, and the inspection records specified in **8.8**.

6 Where the Surveyor decides that the proportion of non-conforming indications is abnormally high, the number of inspections is to be increased.

8.5.2 Visual Testing

The personnel in charge of visual testing is to confirm that the surface condition is acceptable prior to carrying out the inspection. Visual testing are to be carried out in accordance with standards agreed upon between the shipbuilder and the Society.

8.5.3 Liquid Penetrant Testing*

1 Liquid penetrant testing is to be carried out in accordance with *ISO* 3452-1, *ISO* 3452-2, *ISO* 3452-3, *ISO* 3452-4, *JIS Z* 2343-1, *JIS Z* 2343-2, *JIS Z* 2343-3, *JIS Z* 2343-4 or equivalent standards approved by the Society. The aforementioned standards, in principle, refer to the most recent version published.

2 The surfaces of the location of inspections are to be clean and free from any contaminants or paint that may impede the penetration of the inspection media.

3 The temperatures of the locations of inspections are to be typically between 5 °*C* and 50 °*C*. Where the temperature is outside of this temperature range, it is to be as deemed appropriate by the

Society.

8.5.4 Magnetic Particle Testing*

1 Magnetic particle testing is to be carried out in accordance with *ISO* 17638, *JIS Z* 2320-1, *JIS Z* 2320-2, *JIS Z* 2320-3 or equivalent standards approved by the Society. The aforementioned standards, in principle, refer to the most recent version published.

2 The surfaces of the locations of inspections are to be clean, dry and free from any contaminants or paint that may impede the test and its accurate evaluation.

8.5.5 Radiographic Testing*

1 Radiographic testing is to be carried out in accordance with *ISO* 17636, *JIS Z* 3104 or equivalent standards approved by the Society. The aforementioned standards, in principle, refer to the most recent version published.

2 Test length of the location of inspections is to be not less than either 300 *mm* or the overall length of the welds inspected, whichever is smaller.

3 Consideration may be given for a reduction of inspection frequency for automated welds where quality assurance techniques indicate consistent satisfactory quality.

4 The surfaces of the locations of inspections are to be free from any irregularities that may impede the test and its accurate evaluation.

8.5.6 Ultrasonic Testing

1 Ultrasonic testing is to be carried out in accordance with *ISO* 17640, *ISO* 11666, *ISO* 23279 or equivalent standards approved by the Society. The aforementioned standards, in principle, refer to the most recent version published.

2 Test length of the locations of inspections are to be not less than either 300 *mm* or the overall length of the welds inspected, whichever is smaller.

8.6 Non-destructive Testing Criteria

8.6.1 General

1 As far as necessary, testing techniques are to be combined to facilitate the assessment of indications against the acceptance criteria.

2 Where equivalency is established and it is deemed appropriate by the Society, alternative acceptance criteria not specified in this chapter may be applied.

8.6.2 Quality Level

1 For hull constructions, Quality Level C is, in principle, to be applied. Where it is deemed necessary by the Society, Quality level B may be applied.

2 Testing Level and Acceptance Level of non-destructive testing to be applied are to be appropriate level which corresponds to Quality Level agreed by the Society in accordance with **Table M8.2** to **M8.7**.

8.6.3 Testing Level

1 Testing Level specified in **Table M8.2** to **M8.7** stipulates testing coverage and the probability of detection. Accuracy of test and the probability of detection increase from Testing Level A to Testing Level C.

2 Testing Level for non-destructive testing to be applied is to be agreed by the Society. Testing Level D is intended for special applications, and may only be used when defined by specification.

3 Testing Level to be applied is to be specified in the non-destructive testing specifications and the non-destructive inspection plan.

8.6.4 Acceptance Level

Acceptance Level is to be in accordance with each standard specified in **Table M8.2** to **M8.7,** or as deemed appropriate by the Society. The aforementioned standards, in principle, refer to the most recent version published.

8.6.5 Visual Testing Criteria *

The Acceptance Levels and required Quality Levels for visual testing are to be in accordance with **Table M8.2** and deemed appropriate by the Society.

Table M8.2 Each Level of Visual Testing Corresponding to Quality Level

Quality Levels (*ISO* 5817) (1)	Testing Levels (*ISO* 17637) (1)	Acceptance Levels(2)
B	Level not specified	*B*
C		*C*
D		*D*

Notes:

(1) To be in accordance with this standard or an equivalent standard approved by the Society.

(2) The Acceptance Levels for visual testing are the same for the Quality Levels specified in *ISO* 5817.

8.6.6 Liquid Penetrant Testing Criteria

The Acceptance Levels, Testing Level and required Quality Levels for liquid penetrant testing are to be in accordance with **Table M8.3**.

Table M8.3 Each Level of Liquid Penetrant Testing Corresponding to Quality Level

Quality Levels (*ISO* 5817) (1)	Testing Levels (*ISO* 3452-1) (1)	Acceptance Levels (*ISO* 23277)
B	Level not specified	2*X*
C		2*X*
D		3*X*

Note:

(1) To be in accordance with this standard or an equivalent standard approved by the Society.

8.6.7 Magnetic Particle Testing Criteria

The Acceptance Levels, Testing Level and required Quality Levels for magnetic particle testing are to be in accordance with **Table M8.4**.

Table M8.4 Each Level of Magnetic Particle Testing Corresponding to Quality Level

Quality Levels (*ISO* 5817) (1)	Testing Levels (*ISO* 17638) (1)	Acceptance Levels (*ISO* 23278)
B	Level not specified	2*X*
C		2*X*
D		3*X*

Note:

(1) To be in accordance with this standard or an equivalent standard approved by the Society.

8.6.8 Radiographic Testing Criteria

1 The Acceptance Levels, Testing Level and required Quality Levels for radiographic testing are to be in accordance with **Table M8.5**.

2 Reference radiographs are to be submitted to the Society after they are evaluated in accordance with *ISO* 5817, *ISO* 10675-1 or a standard deemed appropriate by the Society. The aforementioned standards, in principle, refer to the most recent version published.

Table M8.5 Each Level of Radiographic Testing Level Corresponding to Quality Level

Quality Levels (*ISO* 5817) (1)	Testing Levels (*ISO* 17636-1) (1)	Acceptance Levels (*ISO* 10675-1)
B	Class *B*	1
C	Class *B*(2)	2
D	At least Class *A*	3

Notes:

(1) To be in accordance with this standard or an equivalent standard approved by the Society.

(2) For circumferential weld testing, the minimum number of exposures may correspond to the requirements of *ISO* 17636-1, Class *A*

8.6.9 Ultrasonic Testing Criteria

1 The Acceptance Level, Testing Level and required Quality Levels for ultrasonic testing are to be in accordance with **Table M8.6** and **M8.7**.

2 Acceptance Level of ultrasonic testing applies to the non-destructive testing of butt welded joints, *T*-joints, corner joints and cruciform joints with full penetration of carbon steels with thicknesses from 8 *mm* to 100 *mm*.

3 Non-destructive inspection specifications for welded joints other than those specified in the preceding **-2** are to be approved by the Society apart from the non-destructive inspection specifications specified in **8.1.2-5**.

4 The nominal frequency of probes used is to be between 2 *MHz* and 5 *MHz*.

5 Acceptance Levels are to be in accordance with *ISO* 11666 or a recognized standard deemed appropriate by the Society. The aforementioned standard, in principle, refers to the most recent version published.

6 The sensitivity levels are to be set in accordance with *ISO* 17640. The aforementioned standard, in principle, refers to the most recent version published.

Table M8.6 Each level of Ultrasonic Testing Level Corresponding to Quality Level

Quality Levels (*ISO* 5817) (1), (2)	Testing Levels (*ISO* 17640) (1), (2)	Acceptance Levels (*ISO* 11666) (1), (2)
B	At least *B*	2
C	At least *B*	3
D	At least *A*	3(3)

Notes:

(1) To be in accordance with this standard or an equivalent standard approved by the Society.

(2) When characterization of indications is required, *ISO* 23279 is to be applied

(3) Ultrasonic testing is not recommended, but can be defined in a specification with same requirement as Quality Level *C*

Table M8.7 Recommended Testing and Quality Levels (*ISO* 17640)

Testing Levels (*ISO* 17640) (1)	Quality Levels (*ISO* 5817)
A	*C*, *D*
B	*B*
C	Quality Level deemed appropriate by the Society
D	Special Quality Level according to application target

Note:
(1) Testing Level D for special application is to be agreed to by the Society.

8.7 Test Records

8.7.1 Test Record Preparation

1 Test records are to be submitted to the Society for confirmation in each stage of the construction process deemed appropriate by the Surveyor.

2 In liquid penetrant testing, magnetic particle testing, radiographic testing and ultrasonic testing, the Surveyor is to decide whether the results are acceptable when the test records are submitted.

3 Test records are to be prepared by the shipbuilder or its subcontractor and are to include the following information:
(1) Date of testing
(2) Location of testing
(3) Position and dimension of the discontinuities
(4) Signature and qualification level of operators and supervisors

4 In the case of liquid penetrant testing, in addition to the preceding **-3**, the following information is to be included in the test records:
(1) Type of penetrant, cleaner and developer used
(2) Penetration time and development time

5 In the case of magnetic particle testing, in addition to the preceding **-3**, the following information is to be included in the test records:
(1) Type of magnetization
(2) Magnetic field strength
(3) Detection media
(4) Viewing conditions
(5) Demagnetization, if required

6 In the case of radiographic testing, in addition to the preceding **-3**, the following information is to be included in the test records:
(1) Radiographs
(2) Type of discontinuity

7 In the case of ultrasonic testing, in addition to the preceding **-3**, the following information is to be included in the test records:
(1) Information and calibration result of ultrasonic equipment used
(2) Echo height of detected discontinuity

8.8 Inspection Records

8.8.1 Inspection Record Preparation

1 Inspection records are to be submitted to the Society for confirmation for each stage of the construction process deemed appropriate by the Surveyor.

2 Inspection records are to be prepared by the shipbuilder or its subcontractor and are to include the following information.

(1) Date of inspection
(2) Hull number, location of inspections and test length
(3) Signature and qualification level of operators
(4) Identification of the component inspected
(5) Identification of the welded joints inspected
(6) Steel grade, welded joint type, base metal thickness and welding procedure
(7) Acceptance criteria
(8) Testing standards used
(9) Testing equipment and arrangement used
(10) Any test limitations, viewing conditions and temperature
(11) Results with references given to acceptance criteria, locations and dimensions of reportable indications
(12) Acceptance criteria for discontinuities, date of evaluation, and signatures of operators
(13) Records of all repaired welds.
(14) Number of repairs if a specific location is repaired more than twice

3 In the case of liquid penetrant testing, in addition to the preceding **-2**, the following information is to be included in the inspection records:

(1) Type of penetrant, cleaner and developer used
(2) Penetration time and development time

4 In the case of magnetic particle testing, in addition to the preceding **-2**, the following information is to be included in the inspection records:

(1) Type of magnetization
(2) Magnetic field strength
(3) Detection media
(4) Viewing conditions
(5) Demagnetization, if required

5 In the case of radiographic testing, in addition to the preceding **-2**, the following information is to be included in the inspection records. This information (including that of the preceding **-2**), in addition to documents, is to be recorded in a medium deemed appropriate by the Society. In addition, where it is to be deemed necessary by the Society, the unprocessed original images and digitally processes images is to be submitted to the Society.

(1) Type and size of radiation source (width of radiation source), X-ray voltage
(2) Type of film/designation and number of film in each film holder/cassette
(3) Number of radiographs (exposures)
(4) Type of intensifying screens
(5) Exposure technique, time of exposure and source-to-film distance
(6) Distance from radiation source to weld
(7) Distance from source side of the weld to radiographic film
(8) Angle of radiation beam through the weld (from normal)
(9) Sensitivity, type and position of *IQI* (source side or film side)
(10) Density
(11) Geometric un-sharpness
(12) Other information deemed necessary by the Society

6 In the case of ultrasonic testing, in addition to the preceding **-2**, the following information is to be included in the inspection records. The method for review and evaluation of ultrasonic testing results are to be confirmed by the Surveyor at a frequency deemed appropriate by the Surveyor.

(1) Type and identification of ultrasonic equipment used (instrument maker, model, series number), probes (instrument maker, serial number), transducer type (angle, serial number and frequency) and type of couplant (brand).
(2) Sensitivity levels calibrated and applied for each probe
(3) Transfer loss correction applied type of reference blocks
(4) Signal response used for defect detection
(5) Reflections interpreted as failing to meet acceptance criteria

8.8.2 Keeping of Inspection Records

The shipbuilder is to keep the inspection records specified in **8.8.1** at least for 5 years.

8.9 Repair of Faulty Welds, etc.

8.9.1 General

Unacceptable indications are to be eliminated and repaired where necessary. The repair welds are to be inspected on their full length using appropriate non-destructive testing method at the discretion of the Surveyor.

8.9.2 Repair and Treatment after the Repair*

1 When unacceptable indications are found, additional areas of the same weld length are to be inspected unless it is agreed to without any doubt by the surveyor and fabricator that the indication is isolated. In the case of automatically welded joints, additional non-destructive testing are to be extended to all areas of the same weld length.

2 All radiographs exhibiting non-conforming indications are to be brought to the attention of the Surveyor. Such welds are to be repaired and inspected as required by the Surveyor. When non-conforming indications are observed at the end of a radiograph, additional radiographic testing is generally required to determine their extent. As an alternative, the extent of non-conforming welds may be ascertained by excavation when approved by the surveyor.

8.9.3 Quality Improvements

1 Additional non-destructive testing can be required at the discretion of Surveyor when repeated non- acceptable discontinuities are found.

2 Where the faulty welds are more than 10 % of the number of inspection, the results of an investigation into the substantial causes of the faults as well as the measures taken to improve quality are to be submitted to the Surveyor.

3 The shipbuilder is to take appropriate action to monitor and improve the quality of welds to the required level. The repair rate is to be recorded by the shipyard and any necessary corrective actions are to be identified in the shipbuilder’s QA system.

EFFECTIVE DATE AND APPLICATION (Amendment 1-4)

1. The effective date of the amendments is 1 July 2021.

2. Notwithstanding the amendments to the Rules, the current requirements 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

Part M Welding

GUIDANCE

2021 AMENDMENT NO.1

Notice No.28 30 June 2021

Resolved by Technical Committee on 27 January 2021

Notice No.28 30 June 2021
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

M1 GENERAL

Section M1.2 has been added as follows.

M1.2 Tests before Welding Works

M1.2.1 Execution of Tests

The wording "survey methods which it considers to be appropriate" in **1.2.1-1, Part M of the Rules** means survey methods which the Society considers to be able to obtain information equivalent to that obtained through traditional ordinary surveys where the Surveyor is in attendance, notwithstanding any of the requirements in this Part.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 1 July 2021.

Amendment 1-2

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 in addition to **Chapter 8**, **Part M of the Rules**.

~~(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~~1) 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~~2) 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.

M8 has been added as follows.

M8 NON-DESTRUCTIVE INSPECTION FOR THE WELDED JOINTS OF HULL CONSTRUCTIONS

M8.1 General

M8.1.1 General

For the wording "deemed appropriate by the Society" specified in **8.1.1-3**, **Part M of the Rules**, in ships of 30 *m* or over in length, the inspections are to be carried out for the block joints of structural members welded in the dry dock, on the slipway or at any other assembly space as shown in **Table M8.1.1-1**. For 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.

Table M8.1.1-1 Members Subject to Inspections and Number of Inspections

Members subject to inspections		Number of inspections for each members subject to inspection[*1, *2]		
		Hull within 0.6*L* amidship		Hull without 0.6*L* amidship
		Butt joints	Seam joints	Butt joints or Seam joints
Strength deck Side shell plating Bottom shell plating Hatch side coaming (including the top plate) [*3]	Plates	$\frac{6}{10}L$ One-third of the above mentioned number is to be the intersections of weld lines	$\frac{2}{10}L$	$\frac{2}{10}L$
Other member[*4]	Plates	$\frac{3}{40}L$ One-third of the above mentioned number is to be the intersections of weld lines	$\frac{1}{40}L$	$\frac{1}{40}L$
	Girders	$\frac{2}{40}L$		
	Frames	$\frac{3}{40}L$		

Notes:

∗1 Number of inspections is to round up decimal places per joints of each members subject to inspections.

∗2 Distribution of number of inspections may change in consideration of the type of ship, structural arrangement, welding process, arrangement of joints, etc.

∗3 Butt joints of the hatch side coaming exceeding 0.15*L* in length.

∗4 For automatic welded joints, the number of inspection may reduce up to the half of the number, upon the approval of Surveyor.

M8.4 General Plan of Non-destructive Inspection

M8.4.2 Location of Inspections

1 The locations of inspections are not to adjoin each other.

2 Where ultrasonic tests are accepted instead of radiographic tests according to the requirements of **8.1.2-5**, the location of inspection of ultrasonic testing are to comply with the following requirements;

(1) For strength deck, side shell plating, bottom shell plating and hatch side coaming (including the top plate), although the number of inspections are to be not more than the half number of

inspections specified in **Table M8.1.1-1**, the locations of inspection are to be approved by the Surveyor. However, the intersections of butt welds are to be excluded.

(2) For structural members except for strength deck, side shell plating and bottom shell plating, the locations of inspection may be all the locations specified in **Table M8.1.1-1**. However, the intersections of the weld lines of plate members are to be excluded.

3 In addition to the preceding **-1** and **-2**, for the wording "Welds for which non-destructive inspections are deemed necessary by the Surveyor" in **8.4.2-1(7)**, **Part M of the Rules**, non-destructive testing is to be carried out for parts of welded joints of hatch corner and welded joints of insert plate for working holes, as decided and instructed by the Surveyor.

4 If deemed necessary in consideration of the following items, the Surveyor may require, additional non-destructive inspections for welds other than those subject to non-destructive inspection, or the alteration of the non-destructive inspection procedure.

(1) The results of visual inspection for welds of the members

(2) The welding condition for the members (welding process, thickness, welding heat input)

M8.4.3 Non-destructive Test Application Procedure

1 Regarding the application of the requirements specified in **8.4.3-8**, **Part M of the Rules**, where welding base metals with different plate thicknesses, the thickness of the thinner plate may be used as the plate thickness of the welded joint.

2 Where the non-destructive testing specified in **8.4.3-8**, **Part M of the Rules** is carried out, the *TOFD* technique may be carried out. In such cases, the shipbuilder or its subcontractor is to obtain the approval of the Society

M8.5 Non-destructive Testing Procedure

M8.5.3 Liquid Penetrant Testing

For the wording "it is to be deemed appropriate by the Society" in **8.5.3-3**, **Part M of the Rules**, special low/high temperature penetrants 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.

M8.5.4 Magnetic Particle Testing

In magnetic particle testing, 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.

M8.5.5 Radiographic Testing

In radiographic testing, marks indicating at least the location of inspections and the symbol that can identify the ship (e.g. ship number), date and time when photographed and something indicating the test condition (i.e. penetrometer and contrast indicator) are to be in the radiograph.

M8.6 Non-destructive Testing Criteria

M8.6.5 Visual Testing Criteria

The wording "deemed appropriate by the Society" in **8.6.5, Part M of the Rules** means *IACS* Recommendation No.47 "Shipbuilding and Repair Quality Standard" or equivalent standard approved by the Society.

M8.9 Repair of Faulty Welds, etc.

M8.9.2 Repair and Treatment after the Repair

1 If the part is judged unacceptable (hereinafter referred to as "faulty welds"), the following measures are to be undertaken. The faulty welds are to be repaired properly.

(1) In the plate members given in **Table M8.1.1-1**, additional non-destructive test is to be carried out for other two parts within the weld lines where the faulty welds are found.

(2) In the girder or frame members given in **Table M8.1.1-1**, additional non-destructive test is to be carried out for two welding joints for each member, which the same welding procedure with the faulty welds is applied to the same block joints.

(3) In preceding **(1)** and **(2)**, additional non-destructive test for automatic welding parts is to be extended to all length or all number of the welded joints.

2 Where faulty welds are found by the non-destructive test specified in preceding **-1**, the following measures are to be carried out for the welded joints.

(1) For the requirements specified in preceding **-1(1)**, non-destructive test is to be extended to all length of the welded joints.

(2) For the requirements specified in preceding **-1(2)**, non-destructive test is to be extended to all number of joints of the members.

(3) For the requirements specified in preceding **-1(3)**, the faulty welds are to be repaired.

(4) Notwithstanding the requirements specified in preceding **(1)** to **(3)**, all length or all number of welded joints may be repaired.

3 The faulty welds, which are detected as a result of non-destructive test specified in preceding **-2(1)** and **(2)**, are to be repaired.

4 Notwithstanding preceding **-1** to **-3,** repair process and additional non-destructive test in other welded joints are to be carried out according to the Surveyor's direction taking account of the condition of faulty welds (kind, size and distribution of defects, etc.).

5 For the requirements specified in preceding **-1** through **-4**, the faulty welds are to be repaired properly in accordance with the repair procedures specified in **2.2.2-3**, **Part M of the Rules**. Subsequent measures of the repaired parts are to be in accordance with the Surveyor's direction.

Annex M1.4.2-2 has been deleted.

~~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, *ISO* 9934-2, *ISO* 9934-3, *JIS Z* 2320-1, *JIS Z* 2320-2, *JIS Z* 2320-3 or the equivalent thereto. The aforementioned standards, in principle, refer to the most recent version published.~~

~~(2) Liquid penetrant examination is to conform to *ISO* 3452-1, *ISO* 3452-2, *ISO* 3452-3, *ISO* 3452-4, *JIS Z* 2343-1, *JIS Z* 2343-2, *JIS Z* 2343-3, *JIS Z* 2343-4 or the equivalent thereto. The aforementioned standards, in principle, refer to the most recent version published.~~

~~**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, *JIS Z* 2305 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. The aforementioned standards, in principle, refer to the most recent version published.~~

~~**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: single pore diameter d (*mm*) $\leqq 0.25t^{(1)}$ with maximum diameter 3 *mm* 2.5d as minimum distance to adjacent pore For fillet welds: single pore diameter d (*mm*) $\leqq 0.25a^{(1)}$ with maximum diameter 3 *mm* 2.5d as minimum distance to adjacent pore
Undercut	For butt welds: depth $\leqq$ 0.8 *mm* whatever in the length depth $\leqq$ 0.5 *mm* with a maximum continuous$^{(2)}$ length of 90 *mm* For fillet welds: 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.~~

Annex M1.4.2-3(1) has been deleted.

~~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~~

~~**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~~

~~**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 carriers applying extremely thick steel plates subject to **32.13, 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~~

~~**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 number of inspections, locations for inspections, welding processes, and non-destructive inspection processes specified in **1.2.3-1** and **1.2.3-3**.~~

~~(2) The locations specified in **1.2.4** for container carriers applying extremely thick steel plates~~

subject to **32.13, Part C of the Rules**.

2 Manufacturers are to give special consideration to the handling of non-destructive inspection plans such as making the plans available to only the personnel in charge of the non-destructive inspection and its supervision, etc. in order to ensure that said inspections are properly conducted.

3 Surveyors may require changes in the locations of non-destructive inspections where deemed necessary even after the non-destructive inspection plan has been approved.

1.1.4 Presence of Non-destructive Inspection

1 For radiographic testing, the Surveyor is to review the records of the test specified in **1.2.1-4(1)** for judgement.

2 For ultrasonic testing, the Surveyor is, in principle, to be present during the test. The Surveyor is also to review the records of the test specified in **1.2.1-4(2)** for judgement.

1.2 Practice of Non-destructive Inspection

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

1 Non-destructive inspection procedure

(1) Radiographic testing is to conform to *ISO* 17636, *JIS Z* 3104 or equivalent thereto. The aforementioned standards, in principle, refer to the most recent version published.

(2) Ultrasonic testing is to conform to *JIS Z* 3060 or equivalent thereto. The aforementioned standards, in principle, refer to the most recent version published.

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, *JIS Z* 2305 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. The aforementioned standards, in principle, refer to the most recent version published.

3 Practice of Tests

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

(2) Test range of non-destructive tests is to be not less than 250 *mm* or overall length of the welds inspected, whichever is smaller.

(3) In radiographic testing, at least marks indicating the tested location and the ship (e.g. ship number), date and time when photographed and something indicating the test condition (i.e. penetrometer and contrast indicator) are to be in the radiograph.

(4) Ultrasonic testing is to be carried out according to the approved procedure after adjusting the range of inspection and the working sensitivity.

4 Records of Tests

(1) In radiographic testing, the records which describe the radiographs specified in **1.2.1-3(3)**, kind and size of defects which are judged according to the requirements specified in **1.3.2** and **1.3.3** and the operator and the judges engaged in the test, are to be made out.

(2) In ultrasonic testing, the records which describe inspection date, inspection spots, conditions of the inspection (detector, test method, calibration result of test instrument, etc.), location of the defects, echo height of the indicator, size of the defects which is judged according to the requirements specified in **1.3.2** and **1.3.4** and the operator and person for judgement engaged in the test, are to be made out. Where the test is carried out together with radiographic test, the records specified in preceding **(1)** are to be comparable with results of the ultrasonic test.

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 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 **32.13, 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.

1.2.3 Members and Spots subjected to Inspections

1 The members subjected to inspections and the number of inspections are to comply with the requirements in **Table 1.2.3-1**. These inspection spots are not to adjoin each other.

2 Where ultrasonic tests are accepted instead of radiographic tests according to the requirements of **1.1.2-2**, the inspection spots of ultrasonic tests are to comply with the following requirements;

(1) For strength deck, side shell plating, bottom shell plating and hatch side coaming (including the top plate), although the number of inspections are to be not more than the half number of inspections specified in **Table 1.2.3-1**, the inspection spots are to be approved by the Surveyor. However, the intersections of butt welds are to be excluded.

(2) For structural members except for strength deck, side shell plating and bottom shell plating, the inspection spots may be all spots specified in **Table 1.2.3-1**. However, the intersections of weld lines of plate members are to be excluded.

3 In addition to preceding **-1** and **-2**, non-destructive testing is to be carried out for parts of start, interrupted and end points of automatic welded joints, welded joints of hatch corner, connections of stern frame or rudder horn made of casting steel to rolled steels for hull, welded joints of insert plate for working holes and welded joints in the vicinity of parts where stress is concentrated, as decided and instructed by the Surveyor.

4 If it is deemed necessary in considering the following items, the Surveyor may require, additional non-destructive inspections for welds other than those subject to non-destructive inspection, or alteration of non-destructive inspection procedure.

(1) The results of visual inspection for welds of the members

(2) The welding condition for the members (welding process, thickness, welding heat input)

Table 1.2.3-1 Members Subject to Inspections and Number of Inspections

Members subject to inspections		Number of inspections for each members subject to inspection[*1, *2]		
		Hull within 0.6*L* amidship		Hull without 0.6*L* amidship
		Butt joints	Seam joints	Butt joints or Seam joints
Strength deck Side shell plating Bottom shell plating Hatch side coaming (including the top plate)[*3]	Plates	$\frac{6}{10}L$ One-third of the above-mentioned number is to be the intersections of weld lines	$\frac{2}{10}L$	$\frac{2}{10}L$
Other member[*4]	Plates	$\frac{3}{40}L$ One-third of the above-mentioned number is to be the intersections of weld lines	$\frac{1}{40}L$	$\frac{1}{40}L$
	Girders	$\frac{3}{40}L$		
	Frames	$\frac{3}{40}L$		

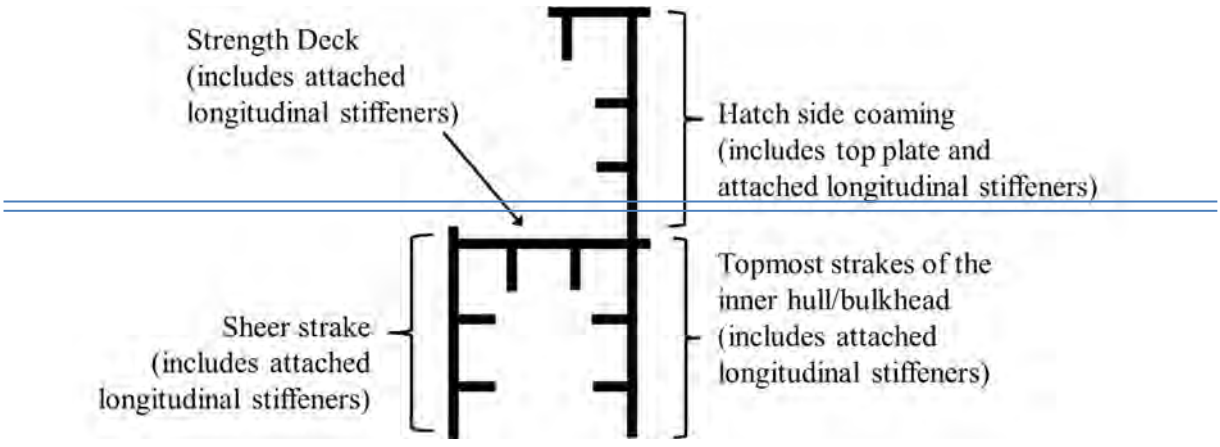
Notes:

- ＊1 Number of inspections is to round up decimal places per joints of each members subject to inspections.
- ＊2 Distribution of number of inspections may change in consideration of the type of ship, structural arrangement, welding process, arrangement of joints, etc.
- ＊3 Butt joints of the hatch side coaming exceeding 0.15*L* in length.
- ＊4 For automatic welded joints, the number of inspection may reduce up to the half of the number, upon the approval of Surveyor.

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 **32.13, 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 Members in Container Carriers subject to additional Non-destructive Inspections



1.3 Acceptable Criteria of Non-destructive Inspections

1.3.1 Determination of Acceptance

1 In radiographic testing, the Surveyor is to decide whether or not the results are acceptable when the test records specified in **1.2.1-4(1)** are submitted.

2 In ultrasonic testing, the Surveyor is to decide whether or not the results are acceptable when the test records specified in **1.2.1-4(2)** are submitted.

1.3.2 Classification of Defects

1 General

(1) 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, *JIS Z* 2305 or the equivalent thereto. The aforementioned standards, in principle, refer to the most recent version published.

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

2 Classification of Defects

Classification of defects is to be as given in **Table 1.3.2-1**.

Table 1.3.2-1 Classification of Defects

Classification of defects		Kind of defects
Type 1		Round blow holes and similar defects
Type 2	*A*	Incomplete fusion, elongated slag inclusion, pipe and similar defects
	B	Incomplete penetration
Type 3		Cracks and similar defects

1.3.3 Defects Detected by Radiographic Test

1 Defect of Type 1

(1) Size of defect of type 1 is to be represented by axis length of the defect. The test field vision specified in **Table 1.3.3-1** is to be selected from radiographic so that the defects of maximum size exists and the sum of size of defects is maximum.

(2) Where distance between the mutual defects does not exceed the size of the larger defect, the size of all defects including the spaces between them is to be considered as the size of the defect.

(3) The defects of type 1 are to be judged unacceptable, if the size of the defects exceeds the value of acceptable criteria specified in **Table 1.3.3-1**.

2 Defect of Type 2

(1) Size of defect of type 2 is to be represented by length of the defect. Where defect of type 2 is coexistent with other defects of the same type, the size of defects is to be measured as follows.

(a) Where defects of type 2-*A*, i.e. incomplete fusion, elongated slag inclusion and pipe are coexistent with each other, all defects are to be considered as the same defects.

(b) Where defects of type 2-*A* and type 2-*B* are coexistent, all defects are to be considered as the defects of type 2-*B*. In this case, the size of the defects is to be the sum of the size of type 2-*B* and half of the size of type 2-*A*.

(2) Where defects are present in a row and the distance between the mutual defects does not exceed the length of larger defect, the sizes of all defects including the spaces between the mutual defects is to be considered as the length of the defect.

(3) The defects of type 2 are to be judged unacceptable, if the length of a defect exceeds the value of acceptable criteria specified in **Table 1.3.3-2**.

3 Defects of Type 3

Any defect of type 3 is to be judged unacceptable.

4 In Case of Coexistence of Defects of Type 1 and Type 2

Where two or more types of defects are coexistent, the defects are to be judged unacceptable, provided the size of defects of each type are more than half of the size specified in **Table 1.3.3-1** and **Table 1.3.3-2** respectively.

Table 1.3.3-1 Defect of Type 1

	Thickness of base metal *t* (*mm*)	*t* ≦10	10 < *t* ≦25	25 < *t* ≦50	50 < *t* ≦100
	Test field of vision	10 *mm*×10 *mm*		10 *mm*×20 *mm*	
Size of Defect	Maximum size of defect (*mm*)	5	5	*t*/5	10
	Sum of size of defect[*1] (*mm*)	5	*t*/2	*t*/2	25

Note:

*1 Where the thickness of base metal is not more than 25 *mm*, the defects of not more than 0.5 *mm* may be ignored. Where the thickness of base metal is more than 25 *mm*, the defects of not more than 0.7 *mm* may be ignored.

Table 1.3.3-2 Defect of Type 2

	Thickness of base metal *t* (*mm*)	*t* ≦50	50 < *t* ≦100	*t* ≦50	50 < *t* ≦100
	Classification of defect	Defect of type 2 *A*		Defect of type 2 *B*	
Size of Defect	Maximum size of defect (*mm*)	*t*/2	25	*t*/2	25
	Sum of size of defect (*mm*)	2*t*	100	*t*	50

1.3.4 Defects Detected by Ultrasonic Test

1 Size of defects is to be of scanning distance, marked by use of measuring distance and echo height which is adjusted by using the standard test block, where the echo height exceeds the dividing echo heights set up by the approved manner.

2 Where the defects are detected to be in the same depth and the distance between the mutual defects does not exceed the size of larger defect, the size of all defects including the spaces between the defects is to be taken as the size of the defect.

3 Where kind of defects is considered as cracks from welding process, location of defects, etc., the defects are to be judged unacceptable.

4 For kind of defects other than cracks, the defects of which exceed either size of defects specified in **Table 1.3.4-1** are to be judged unacceptable.

Table 1.3.4-1 Defects Detected by Ultrasonic Test

Disregard level and detected region of echo		Thickness of base metal *t* (*mm*)	
Disregard level[*1]	Region[*2]	*t* ≦50	50 < *t*
M disregard level	III	*t*	50
L disregard level	II and III	*t*	50
M disregard level or *L* disregard level	IV	*t*/2	25

Notes:

*1 Disregard level means the distance amplitude characteristics of ultrasonic test instrument developed by the procedures specified as follows.

(1) Measurement of probe index, adjustment of measurement range and measurement of beam angle by the calibration block are to be carried out.

(2) After the standard hole, e.g. ϕ 4 *mm*×4 *mm*, is detected from the point which beam axis reflects at the bottom of plate and subsequently the probe is placed at the position in which the maximum echo height is detected, the sensitivity is to be adjusted so that the echo height at the time assumes 100%

(3) Each echo height of 6 *dB* and 12 *dB* lower than the sensitivity specified in preceding **(2)** is to be plotted.

(4) After the sensitivity was reset to that specified in preceding **(2)**, the similar adjustment is to be carried out at the points where the beam reflecting the back reaches the detected surface and subsequently the beam reflects the back and the echo heights are to be plotted.

(5) To connect the plotted points with a straight line at each sensitivities.

(6) Among the curves for dividing echo height marked according to the above, the highest curve is to be selected as the *H* line, the middle curve is to be selected as the *M* line and the lowest curve is to be selected as the *L* line. Further, the sensitivities at the time when these lines are made are to be taken as *H* disregard level, *M* disregard level and *L* disregard level respectively.

*2 Regions are to be taken as the table specified below.

Range of echo height	Regions of echo height
L line or under	I
Over *L* line, and up to incl. *M* line	II
Over *M* line, and up to incl. *H* line	III
Over *H* line	IV

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

1 If the part is judged unacceptable according to the requirement specified in **1.3.1** (hereinafter referred to as "faulty welds"), the following measures are to be undertaken. The faulty welds are to be repaired properly.

(1) In the plate members given in **Table 1.2.3-1**, additional non-destructive test is to be carried out for other two parts within the weld lines where the faulty welds are found.

(2) In the girder or frame members given in **Table 1.2.3-1**, additional non-destructive test is to be carried out for two welding joints for each member, which the same welding procedure with the faulty welds is applied to the same block joints.

(3) In preceding **(1)** and **(2)**, additional non-destructive test for automatic welding parts is to be extended to all length or all number of the welded joints.

2 Where faulty welds are found by the non-destructive test specified in preceding **-1**, the following measures are to be carried out for the welded joints.

(1) For the requirements specified in preceding **-1(1)**, non-destructive test is to be extended to all length of the welded joints.

(2) For the requirements specified in preceding **-1(2)**, non-destructive test is to be extended to all number of joints of the members.

(3) For the requirements specified in preceding **-1(3)**, the faulty welds are to be repaired.

(4) Notwithstanding the requirements specified in preceding **(1)** to **(3)**, all length or all number of welded joints may be repaired.

3 The faulty welds, which are detected as a result of non-destructive test specified in preceding **-2(1)** and **(2)**, are to be repaired.

4 Notwithstanding preceding **-1** to **-3,** repair process and additional non-destructive test in other welded joints are to be carried out according to the Surveyor's direction taking account of the condition of faulty welds (kind, size and distribution of defects, etc.).

5 For the requirements specified in preceding **-1** through **-4**, the faulty welds are to be repaired properly in accordance with the repair procedures specified in **2.2.2-3**, **Part M of the Rules**. Subsequent measures of the repaired parts are to be in accordance with the Surveyor's direction.

1.4.3 Improvement of Qualification

Where the faulty welds are more than 10% of the number of inspection specified in **Table 1.2.3-1**, the results of investigation on the substantial cause and the measures to improve the quality are to be submitted to the Surveyor.

~~**1.5　　Submission and Keeping of Inspection Records**~~

~~**1.5.1　　Submission of Survey Records**~~

~~**1**　　The manufacturer is to make out the inspection records including the result of judgement for acceptance specified in preceding **1.2** and **1.3**, to submit to the Surveyor at every ships and to obtain the confirmation of the Surveyor.~~

~~**2**　　The inspection records specified in preceding **-1** are to include the records of the repaired parts specified in **1.4.2**.~~

~~**1.5.2　　Keeping of Inspection Records**~~

~~　　The manufacturer is to keep the inspection records specified in **1.5.1** at least for 5 years.~~

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 1 July 2021.

2. Notwithstanding the amendments to the Guidance, the current requirements 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.