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Ships and marine technology — Bulk carriers — Construction quality of hull structure

Navires et technologie maritime — Vraquiers — Qualité de construction de la structure de la coque

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15401 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 8, *Structures*.

Introduction

The aim of this International Standard is to provide guidelines for good shipbuilding production conditions.

Details, where appropriate, given in this International Standard were developed with reference to applicable International Association of Classification Societies (IACS) rules and requirements.

Ships and marine technology — Bulk carriers — Construction quality of hull structure

SAFETY PRECAUTIONS — It is the responsibility of the user of this International Standard to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.

1 Scope

This International Standard specifies the quality requirements for the hull construction of steel bulk carriers. It does not apply to double-skin bulk carriers.

Requirements for the maintenance and repair of steel bulk carriers are given in ISO 15402.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 8501-1:1988, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings* and its Informative Supplement of 1994, *Representative photographic examples of the change of appearance imparted to steel when blast-cleaned with different abrasives.*

ISO 8503-1:1988, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces.*

IMO A.798 (19), *Guidelines for the selection, application and maintenance of corrosion prevention systems of dedicated seawater ballast tank.*

ISO 15402, *Ships and marine technology — Bulk carriers — Repair quality of hull structure.*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
bulk carrier
ship which is generally constructed with a single deck, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk

3.2
length L
the definition is taken from the rules of classification societies

4 Quality control through construction

4.1 Steel material

4.1.1 Upon arrival in the yard, all steel materials intended for ship construction shall be checked against quality certificates. A visual inspection shall be carried out to confirm their quality.

4.1.2 All steel materials shall be stored according to sizes and brand and kept flat.

4.1.3 All steel materials shall be issued against material allocation sheets according to the construction plan.

4.1.4 A quality inspection shall be carried out on the steel materials before processing.

Special attention shall be paid to the following points of quality control:

a) material quality documentation;

b) size, brand, charge number and batch number;

c) minus tolerance in thickness for plates and sections;

d) lamination and surface defects;

e) any defects in large forgings and castings.

4.2 Steel processing

4.2.1 Marking and cutting

4.2.1.1 Necessary pretreatments such as: levelling, straightening, derusting and application of shop primer shall be carried out on the plates and sections before putting them into production.

4.2.1.2 Numerical control cutting and other highly efficient high-precision cutting shall be used to the widest possible extent to improve cutting accuracy.

4.2.1.3 Information related to material property, charge number and batch number shall be filed for important members.

4.2.1.4 Special attention shall be paid to the following points of quality control:

a) size deviation;

b) angular deviation;

c) marks such as processing symbols, codes and technological numbers;

d) cutting accuracy;

e) dimensions of configuration.

4.2.2 Forming

4.2.2.1 Hot or cold bending of steel plates and sections shall be performed according to the applicable technology requirements for different properties and grades of materials.

4.2.2.2 Special attention shall be paid to the following points of quality control:

a) heating temperature;

b) accuracy of bending.

4.3 Fitting and assembly

4.3.1 Fitting and assembly of parts and members

4.3.1.1 The accuracy requirements of block assembly shall be met for the fitting and assembly of parts and members. Protective primer shall be repaired after welding.

4.3.1.2 Special attention shall be paid to the following points of quality control:

a) geometrical dimensions of parts and members;

b) installation locations;

c) excessive gap before welding;

d) deformation.

4.3.2 Block assembly

4.3.2.1 Block assembly should generally be carried out on a platform or jig.

4.3.2.2 Pre-outfitting of parts and members shall be done according to applicable design drawings.

4.3.2.3 The accuracy that meets the requirements given in the following pages for general assembly shall also be met for block assembly.

4.3.2.4 Block assemblies may be coated after inspection.

4.3.2.5 Special attention shall be paid to the following points of quality control:

a) marking accuracy;

b) installation accuracy of internal structure joints inside the block;

c) accuracy of block configuration and its dimensional size;

d) accuracy of block edges;

e) correctness of assembling reference lines;

f) flatness of face plate and location deviation of main engine bed;

g) installation locations of key components, such as shaft boss, rudder horn, etc.

4.3.3 Erection on shipway/dock

4.3.3.1 Marking on the shipway/dock shall be carried out with corresponding symbols and marks.

4.3.3.2 Placing the reference block in position, and then proceeding with successive blocks shall be done according to the shipway/dock assembly schedule.

4.3.3.3 During the construction process, all temporary openings in strength members and their closing-up shall comply with the requirements set out in the applicable construction drawings and/or standards.

4.3.3.4 Removing temporary welding pieces and lifting eyepieces shall be done according to usual practice (refer to Table 37).

4.3.3.5 After completing shipway/dock assembly, the hull shall be coated or the (block) coating repaired according to specified requirements before launching.

4.3.3.6 Special attention shall be paid to the following points of quality control:

a) accuracy of marking on the shipway/dock;

b) correctness of location of the reference block;

c) frame spacing at block junctions;

d) alignment accuracy of structural members;

e) straightness of base line;

f) alignment accuracy of propeller shaft centreline;

g) marking accuracy of loadline and draft marks;

h) principal dimensions of the hull.

4.4 Welding

4.4.1 Preparation before welding

Welding materials, preparation of weld joints and assembly accuracy shall comply with classification society requirements set out in quality control documents.

The welding zone shall be free of rust, scales, grease, moisture or other dirt.

The environmental condition of the welding area shall be kept in good order.

Tack welding shall be carried out according to specified technological procedures.

Wherever new materials or new welding technologies are adopted, test reports and welding procedures shall be submitted to the classification society for approval.

4.4.2 Welding process

All welding shall be carried out according to the methods and conditions as required by the welding technology procedures. Proper measures for minimizing welding deformation shall be taken.

4.4.3 Welding inspection

4.4.3.1 Inspection of welding shall be carried out throughout the whole process of welding including inspections before, during and after welding, as well as the inspection of finished weldments.

4.4.3.2 All welds shall be visually examined first.

4.4.3.3 Quality inspection of welded seams shall be carried out according to specified requirements. Either X-ray detection, ultrasonic detection or other inspection methods approved by the classification society shall be adopted.

4.4.3.4 Leg sizes (leg length and throat depth) of fillet welds shall comply with the design plan and relevant codes as approved by the classification society.

4.4.3.5 Welded joints on the strength deck, shell plate and interior strength members in the mid-length region shall be inspected in accordance with the non-destructive inspection plan approved by the classification society.

4.4.3.6 Welds not conforming to the requirements of quality standards shall be rectified and repaired, and shall be inspected again.

4.4.4 Quality control

Special attention shall be paid to the following points of quality control:

a) qualification of welders;

b) welding materials;

c) welding codes;

d) groove sizes and seam clearance;

e) cleanness of welding region;

f) preheating and heat-retaining;

g) welding deformation;

h) sizes of welded seams;

i) integrity of all-around welds;

j) surface and inner defects in welding seam.

4.5 Tightness test

4.5.1 General requirements

4.5.1.1 The tightness test shall be conducted after the main hull and the structure are completed. All accessories affecting the tightness should be fixed and non-destructive testing shall be correctly completed.

4.5.1.2 All welding seams related to the tightness test, shall be free of scales, slugs, coatings (excluding primers) or any grease (refer to Table 48).

4.5.1.3 The tightness test for the hull structure shall be performed with either water jet, hydrostatic pressure, air pressure or other equivalent methods depending on the hull strength and tightness requirement.

4.5.1.4 The tightness test may be performed on blocks.

4.5.1.5 The location and requirements for the tightness test shall be in compliance with the requirements of the classification society.

4.5.2 Quality control

Special attention shall be paid to the following points of quality control:

a) cleaning of welded seams;

b) test pressure;

c) test procedure;

d) test duration;

e) inspection for deformation and leakage.

4.6 Coating

4.6.1 Pretreatment of steel surface

Surface pretreatment of steel shall be done in general by means of shot-blasting, abrasive blasting and chemical cleaning (shop primer shall be applied after derusting).

Surface pretreatment shall be done in accordance with the quality stipulations given in Table 45.

Shop primer shall be applied according to the quality stipulations given in Table 46.

4.6.2 Shop primer touch-up

Any damaged shop primer shall be touched up after completion of the welding process.

4.6.3 Second derusting and surface cleaning

Second derusting and surface cleaning shall be done in accordance with the quality stipulations given in Table 47 and Table 48.

4.6.4 Coating work

4.6.4.1 Precoating

Precoating shall be done for the spots and areas that cannot be easily accessed or which are difficult to reach to obtain the required film thickness by spraying.

4.6.4.2 Coating

Coating may be done by means of either airless spraying or roller application, etc.

4.6.4.3 Quality control

Special attention shall be paid to the following points of quality control:

a) environmental conditions affecting coating operation;

b) appearance of coat;

c) wet film thickness or dry film thickness;

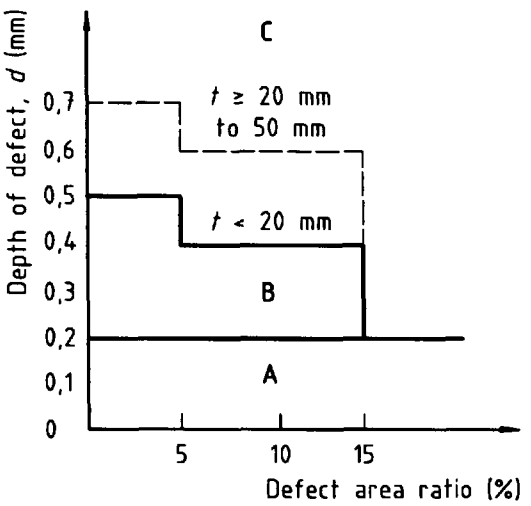
d) film thickness allocation.

5 Hull construction accuracy

5.1 Steel material

5.1.1 Surface defects of steel plates shall be kept within the limits given in Table 1.

Table 1 — Surface defects of steel plates

Items		Requirements
Pits, flaking, scars, scratches and air bubbles		(1) **Zone A** is in excellent order, with very slight surface defects less than 0,2 mm and no repairing is required. (2) **Zone B** is in good order, with a certain amount of permissible surface defects, and no repairing is required. Area enclosed by full line denotes plate with thickness less than 20 mm and area enclosed by dotted line (including straight line) denotes plates with thickness from 20 mm to 50 mm. (3) **Zone C** is in disorder, and repairing is required, i.e. there are certain amounts of impermissible surface defects that shall be repaired according to the requirement. (4) Repair method for surface defects: for $d < 0{,}07\,t$, by grinding (but in any case $d \leqslant 3$ mm); for $0{,}07\,t \leqslant d \leqslant 0{,}2\,t$, by built-up welding and followed by grinding, where d is defect depth, in millimetres; t is plate thickness, in millimetres. When the defect depth exceeds 20 % of the plate thickness and the defect area exceeds 2 % of the plate area, this part of the plate shall be replaced.

5.1.2 Lamination of steel plate shall be treated according to Table 2.

Table 2 — Lamination of steel plate

Items		Requirements
Local lamination	 a) b)	(1) When the range of lamination is fairly small, it may be chipped out and built-up by welding as given in Figure a). When the range of lamination is fairly small and near the plate surface, it is preferable to do built-up welding as given in Figure b). (2) When the lamination is severe and defective, it shall be carefully examined and repaired by an appropriate method. If welding extending over 20 % of the plate edges is used as a method of repair, non-destructive testing shall be applied to this area.
Severe lamination		(1) It is recommended to exchange part of the plate in case the lamination is fairly extensive. (2) Minimum breadth or length of the part of standard size plate to be replaced. For shell plate or strength-deck plate: within 0,6 L amidship — 1 600 mm; outside 0,6 L amidship — 800 mm. For other members: 300 mm or 10 times the plate thickness, whichever is greater. In specific cases, the above dimension may be reduced to 50 mm + 4 t; where t is the plate thickness in millimetres. (3) The whole plate shall be replaced when the lamination is extremely severe and extensive.

5.1.3 The minus tolerance in thickness for plates of the hull structure shall be in compliance with the requirements given in Table 3.

Table 3 — Minus tolerance in thickness for plates of hull structure

Dimensions in millimetres

Items	Allowable limits
Minus tolerance in thickness for plates of hull structure	0,30

5.1.4 Surface defects of casting steel shall be treated according to Table 4.

Table 4 — Surface defects of casting steel

Items		Remarks
When the depth of the defect is over 20 % of the item thickness		Repairing and building up shall be done according to the requirement and regulations of the classification surveyor
When the depth of the defect is below 20 % of the item thickness	the defect is over 25 mm in depth or 150 m in length	Repairing and building up shall be done by an appropriate method after non-destructive inspection
	the defect is below 25 mm in depth and 150 mm in length	Repairing and building up shall be done by an appropriate method
Air bubbles, flaws and other harmful defects		Repairing and building up shall be done by an appropriate method after non-destructive inspection

5.2 Marking

5.2.1 The position deviation of marking shall be kept within the limits given in Table 5.

Table 5 — Position deviation of marking

Dimensions in millimetres

Items	Standard range	Allowable limits
Deviation of centreline, theoretical lines, alignment lines, check lines and installation position line	± 2,0	± 3,0

5.2.2 The deviation of marking dimensions of parts and members shall be kept within the limits given in Table 6.

Table 6 — Deviation of marking dimensions of parts and members

Dimensions in millimetres

Items		Standard range	Allowable limits	Remarks
Length		± 2,0	± 3,0	
Breadth		± 1,5	± 2,5	
Difference between diagonals		± 2,0	± 3,0	For rectangular plate
Curved configuration		± 1,5	± 2,5	
Straightness	$l \leqslant 4$ m	$\leqslant$ 1,0	$\leqslant$ 1,2	For straight edges of parts or members
	4 m $< l \leqslant$ 8 m	$\leqslant$ 1,2	$\leqslant$ 1,5	
	$l >$ 8 m	$\leqslant$ 2,0	$\leqslant$ 2,5	
Angle		± 1,5	± 2,0	For every metre
Cut out, opening		0 to 1,5	0 to 2,0	

5.2.3 The deviation of marking dimension of block structure shall be kept within the limits given in Table 7.

Table 7 — Deviation of marking dimension of block structure

Dimensions in millimetres

Items	Standard range	Allowable limits
Deviation of marking line of panel block, compared with designed dimensions	± 2,5	± 3,5
Location of member for installing on block, compared with designed position	± 2,5	± 3,5

5.3 Cutting

5.3.1 Gas cutting

5.3.1.1 The surface roughness of gas cutting shall be kept within the limits given in Table 8.

Table 8 — Surface roughness of gas cutting

Dimensions in millimetres

Items			Standard range	Allowable limits	Remarks
Free edges of members	Important members	Automatic, semiautomatic cutting	0,10	0,20	(1) For steel sections, tolerance of machine cutting is the same as those for manual cutting (2) Burrs on free edges should be removed
		Manual cutting	0,15	0,30	
	Others	Automatic, semiautomatic cutting	0,10	0,20	
		Manual cutting	0,50	1,00	
Weld chamfers	Important members	Automatic, semiautomatic cutting	0,10	0,20	
		Manual cutting	0,40	0,80	
	Others	Automatic, semiautomatic cutting	0,10	0,20	
		Manual cutting	0,80	1,50	

5.3.1.2 The notches of gas cutting shall be kept within the limits given in Table 9.

Table 9 — Notches of gas cutting

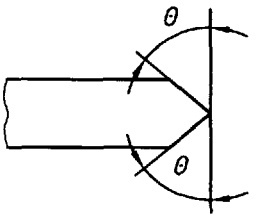
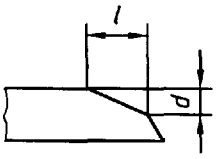
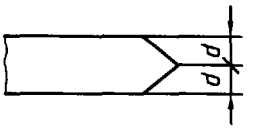
Dimensions in millimetres

Items			Standard range	Allowable limits	Remarks
Free edges of members	Upper edge of sheer strake, strength deck, and free edges of opening on shell plate within 0,6 L amidship		—	No notch	(1) "Notch" is defined as groove more than 3 times the surface roughness. (2) Repairing method: a) finishing by grinding; b) bead welding may be applied where required, but short bead shall be carefully avoided.
	Important longitudinals and transverses		—	< 1,0	
	Others		—	< 3,0	
Weld edges	Butt weld	Shell plate and strength deck within 0,6 L amidship	—	< 2,0	Notch shall be repaired by grinding or built-up welding
		Others	—	< 3,0	
	Fillet weld		—	< 3,0	

5.3.1.3 The deviation of gas-cutting dimension shall be kept within the limits given in Table 10.

Table 10 — Deviation of gas cutting dimension

Dimensions in millimetres

Items			Standard range	Allowable limits	Remarks
Straightness of plate edge	Automatic welding seam		0,4	0,5	
	Semi-automatic and manual welding seam		1,0	2,5	
Dimensions of chamfers	Angle of groove, θ		$\theta = \pm 2°$	$\theta = \pm 4°$	
	Length of taper, l		$l = \pm 0,5d$	$l = \pm 1,0d$	
	Depth of groove, d		$d = \pm 1,5$	$d = \pm 2,0$	
Size of member	Size of member as compared with correct size		± 3,5	± 5,0	
			± 2,0	± 4,0	For members with high accuracy demand such as floors and girders, etc. in double bottom
	Breadth of face bar as compared with correct size		± 2,0	+ 4,0 − 3,0	

5.3.2 The deviation of shearing dimension shall be kept within the limits given in Table 11.

Table 11 — Deviation of shearing dimension

Dimensions in millimetres

Items	Standard range	Allowable limits
Length of member	± 3,0	± 4,0
Breadth of member	± 2,0	± 3,0
Breadth of face bar, height of floor	± 2,0	± 3,0
Straightness of the edge	± 1,0	± 1,5
Curved edge	± 1,5	± 2,0

5.3.3 The deviation of planed and milled edges shall be kept within the limits given in Table 12.

Table 12 — Deviation of planed and milled edges

Dimensions in millimetres

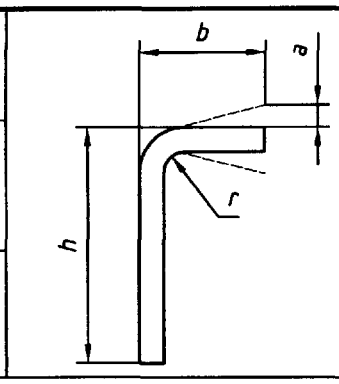
Items	Standard range	Allowable limits
Edge straightness	⩽ 0,5	⩽ 1,0
Angle of edge preparation	± 2°	± 3°

5.4 Bending

5.4.1 The deviation of flanging shall be kept within the limits given in Table 13.

Table 13 — Deviation of flanging

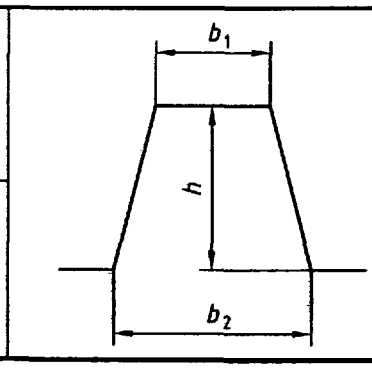
Dimensions in millimetres except where otherwise stated

Items			Standard range	Allowable limits	Remarks
Breadth of flange, b			± 3,0	± 5,0	
Depth of web, h		Principal members	± 2,0	± 3,0	
		Others	± 3,0	± 5,0	
Deviation of flange, a			± 2,5	± 4,5	per 100 in breadth
Curvature in the plane of flange			± 10	± 25	Per 10 m in length
Curvature in the plane of web			± 10	± 25	

5.4.2 The deviation of corrugated plate shall be kept within the limits given in Table 14.

Table 14 — Deviation of corrugated plate

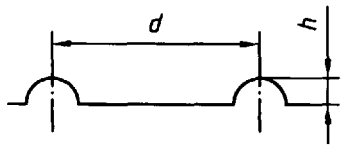
Dimensions in millimetres

Items		Standard range	Allowable limits
Depth of corrugation, h		± 3,0	± 6,0
Breadth of corrugation, b_1 and b_2		± 3,0	± 6,0

5.4.3 The deviation of channelled plate shall be kept within the limits given in Table 15.

Table 15 — Deviation of channelled plate

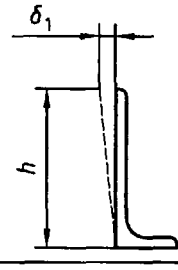
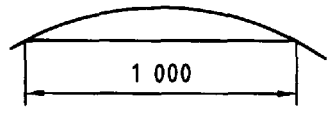
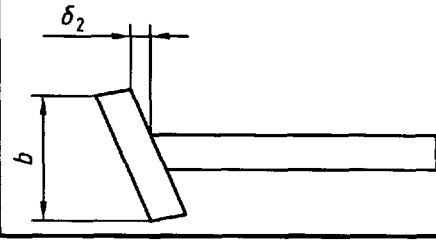
Dimensions in millimetres

Items			Standard range	Allowable limits
Depth of channel, h			± 2,5	± 5,0
Pitch of channel, d		regular	± 2,0	± 3,0
		irregular	± 6,0	± 9,0

5.4.4 The bending deviation of sections and built-up profiles shall be kept within the limits given in Table 16.

Table 16 — Bending deviation of sections and built-up profiles

Dimensions in millimetres except where otherwise stated

Items			Standard range	Allowable limits	Remarks
Sections	Angular deviation, δ_1		± 1,5	± 2,0	per 100 in h
	Local bending deviation		± 1,0	± 1,5	per 1 m in length, compared with template
Build-up profiles	Bending deviation		± 2,0	± 4,0	per 10 m in length, compared with template
	Inclination of face plate, δ_2		± 1,5	± 3,0	per 100 in b

5.4.5 The bending deviation of shell plates shall be kept within the limits given in Table 17.

Table 17 — Bending deviation of shell plates

Dimensions in millimetres

Items		Standard range	Allowable limits	Remarks
Plate with single curvature	Gap between curved plate and template	⩽ 2,5	⩽ 5,0	Within each frame spacing
	Straightness of check line on triangular template	⩽ 2,5	⩽ 5,0	
Plate with double curvature	Deviation between drawn line and reference line on template	± 2,0	± 3,0	Within each frame spacing
	Gap between plate and box template in breadthwise direction	⩽ 4,0	⩽ 5,0	
	Gap between plate and box template in lengthwise direction	⩽ 3,0	⩽ 5,0	

5.4.6 The heating procedure shall be according to the requirements given in Table 18.

Table 18 — Heating

Items			Standard range	Allowable limits	Remarks
Maximum heating temperature on surface	High tensile steel Ceq > 0,38 %	Water cooling immediately after heating	Under 650 °C	650 °C	Calculation formula for carbon equivalent: Ceq = C + Mn/6 +(Cr+Mo+V)/5 +(Ni+Cu)/15
		Air cooling after heating	Under 900 °C	900 °C	
		Air cooling and subsequently water cooling after heating	Air cooling under 900 °C, water cooling started when temperature below 500 °C	Air cooling at 900 °C, water cooling started when temperature at 500 °C	
	High tensile steel Ceq ⩽ 0,38 % Grades A, D	Water or air cooling immediately after heating	Under 1 000 °C	1 000 °C	
	High tensile steel Ceq ⩽ 0,38 % Grades E	Water or air cooling immediately after heating	Under 900 °C	900 °C	

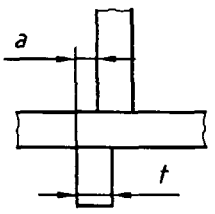
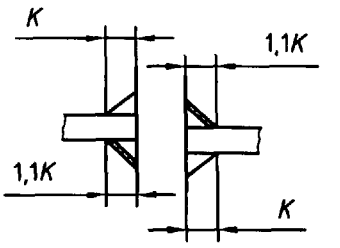
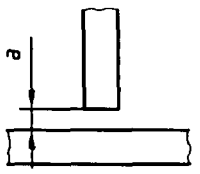
5.5 Fitting and assembly

5.5.1 Fitting and assembly accuracy for various welding joints

5.5.1.1 The position deviation of fillet-welding joints shall be kept within the limits given in Table 19.

Table 19 — Position deviation of fillet-welding joints

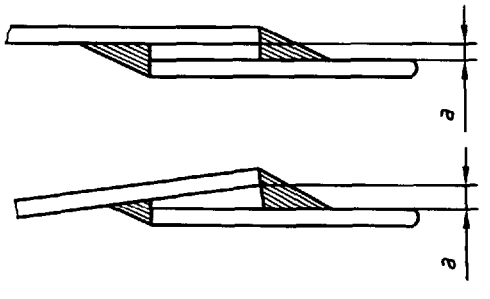
Dimensions in millimetres

Items			Standard range	Allowable limits	Remarks
Alignment of fillet joint	 a is misalignment t is thickness of thinner plate	Primary strength members	$\leqslant t/4$	$\leqslant t/3$	(1) When $t/3 \leqslant a \leqslant t/2$, the leg of fillet welding should be increased as shown in the figure below  K is specified dimension of fillet (2) when $a > t/2$, joint should be reassembled
		Others (stressed members)	$\leqslant t/3$	$\leqslant t/2$	Deviation exceeding allowable values shall be modified accordingly
Gap before fillet welding			$\leqslant 2$	$\leqslant 3$	Treatment for exceeding allowable limit: (1) When $3 \leqslant a \leqslant 5$, leg length shall be increased by $(a-2)$ (2) When $5 < a \leqslant 16$, liner or build-up weld may be adopted (3) When $a > 16$, vertical plate shall be cut and replaced by new plate with height not less than 300 mm

5.5.1.2 The deviation of lap-welding joints shall be kept within the limits given in Table 20.

Table 20 — Deviation of lap-welding joints

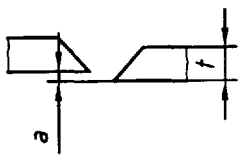
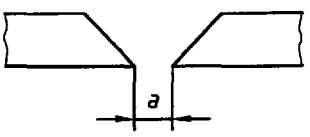
Dimensions in millimetres

Items	Standard range	Allowable limits	Remarks
	$\leqslant 2$	$\leqslant 3$	Treatment for exceeding allowable limit: (1) when $3 \leqslant a \leqslant 5$, leg shall be increased by $(a-3)$; (2) when $a > 5$, reassembly is required.

5.5.1.3 The deviation of butt-welding joints shall be kept within the limits given in Table 21.

Table 21 — Deviation of butt-welding joints

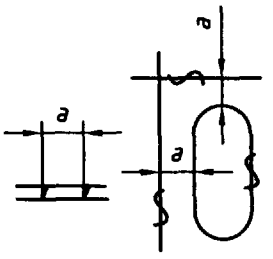
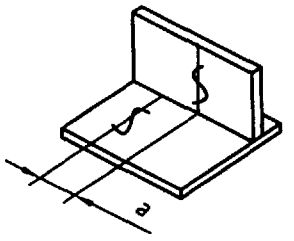
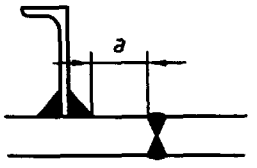
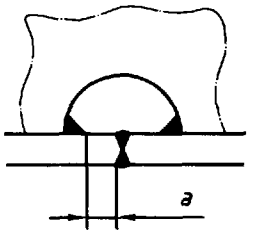
Dimensions in millimetres

Items			Standard range	Allowable limits	Remarks
Deviation of welding seam		Important members	$\leqslant 0{,}1t$, and $\leqslant 3$	$\leqslant 0{,}15t$, and $\leqslant 3$	Deviations exceeding allowable limits shall be reinstalled. a is misalignment; t is thickness of thinner plate.
		Others	$\leqslant 0{,}15t$, and $\leqslant 3$	$\leqslant 0{,}2t$, and $\leqslant 3$	
Gap of chamfers by manual welding			2 to 3,5	$\leqslant 5{,}0$	Treatment when exceeding allowable limit: (1) When $5 < a \leqslant 16$, a) add steel backing bar and weld the front; b) remove steel backing bar and finish back weld. (2) When $16 < a \leqslant 25$, a) add steel backing bar, welding main seam only after one slope of the front is in correct form; b) remove steel backing bar and finish back weld. (3) When $a > 25$, renew the plate partially and reinstall.

5.5.1.4 The distance between welds shall be in accordance with the limits given in Table 22.

Table 22 — Distance between welds

Dimensions in millimetres

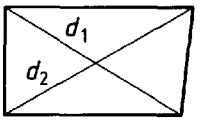
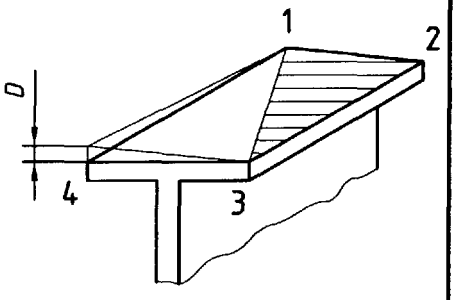
Items			Standard range	Allowable limits	Remarks
Between butt welds			—	⩾ 30	When the details of construction are not defined in the approved plans, they shall be decided by mould lofting or in working drawings, and within the limits given in the sketch shown on the left.
			—	⩾ 0	
Between butt and fillet welds		Principal members	—	⩾ 10	
		Others	—	⩾ 0	
		Principal members	—	⩾ 5,0	
		Others	—	⩾ 0	

5.5.2 Sub-assembly

5.5.2.1 The accuracy of installation dimensions for flat and curved sub-assemblies shall be in compliance with the requirements given in Table 23.

Table 23 — Accuracy of installation dimensions for flat and curved sub-assemblies

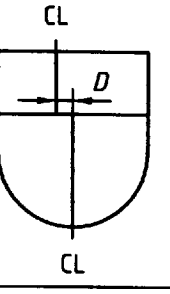
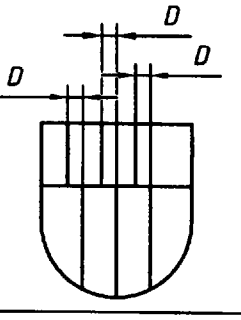
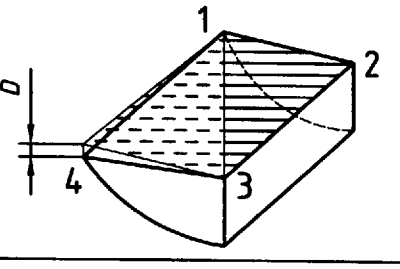
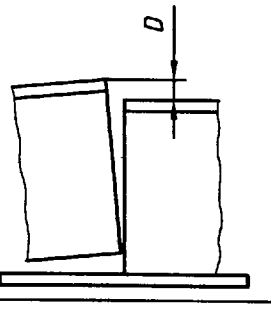
Dimensions in millimetres

Items		Standard range	Allowable limits	Remarks
Breadth of sub-assembly	Flat	± 4	± 6	
	Curved		± 8	
Length of sub-assembly	Flat	± 4	± 6	
	Curved		± 8	
Squareness of sub-assembly (difference D between diagonals d_1 and d_2 in final marking)	Flat	4	8	$D = d_1 - d_2$ 
	Curved	10	15	
Distortion of sub-assembly (measured on face plates of beam or girder)		10	20	 D = vertical distance of point 4 from plane 1, 2, 3
Deviation of the distance between joints of interior members and skin plate		± 5	± 10	

5.5.2.2 The accuracy of installation dimensions of block assemblies shall be in compliance with the requirements given in Table 24.

Table 24 — Accuracy of installation dimensions of block assemblies

Dimensions in millimetres

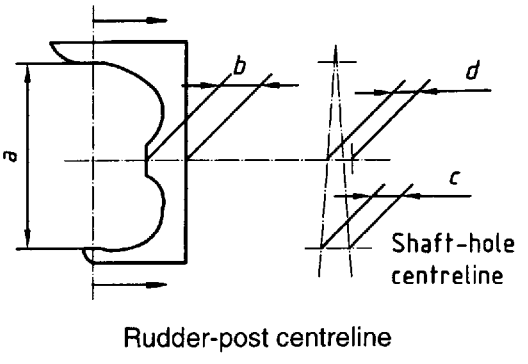
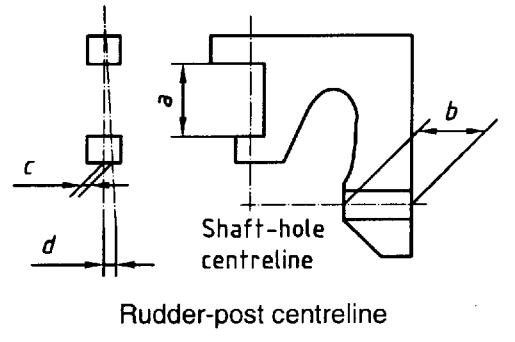
Items		Standard range	Allowable limits	Remarks
Deviation of centrelines between upper and lower planes	Flat block	5	10	
	Curved block	7	15	
Deviation of frame lines between upper and lower planes	Flat block	5	10	
	Curved block	7	15	
Twist of assembly (for large, rigid block assembly)	Flat block	10	20	
	Curved block	15	25	
Deviation of height [a] for structures at the same level		± 4	± 6	
Deviation in height [a] for structures at two different levels		± 5	± 10	
Others, same as for plane and curved sub-assemblies in Table 23		—	—	

[a] The "height" means vertical distance from the same datum plane.

5.5.2.3 The accuracy of installation dimensions of block assemblies of stern frame shall be in compliance with the requirements given in Table 25.

Table 25 — Accuracy of installation dimensions of block assemblies of stern frame

Dimensions in millimetres

Items		Standard range	Allowable limits
Distance between upper and lower rudder carriers, *a*		± 5	± 10
Distance between aft edge of boss and aft peak bulkhead, *b*			
Inclination of sub-assembly, *c*		5	10
Deviation of rudder-post centreline from shaft centrelines, *d*		4	8
Others, same as for those in Table 24.		—	—

5.5.2.4 The accuracy of installation dimensions of assemblies including the main engine foundation shall be in compliance with the requirements given in Table 26.

Table 26 — Accuracy of installation dimensions of assemblies including main engine foundation

Dimensions in millimetres

Items	Standard range	Allowable limits	Remarks
Flatness of face plate of main engine foundation	⩽ 5	⩽ 10	
Length and breadth of face plate of main engine foundation	± 4	± 6	If the foundation is the part of longitudinal girder construction, measure the deviation from the centreline
Others, same as for those in Table 24.	—	—	

5.5.2.5 The assembly deviation on the shipway/dock shall be kept within the limits given in Table 27.

Table 27 — Assembly deviation on the shipway/dock

Dimensions in millimetres

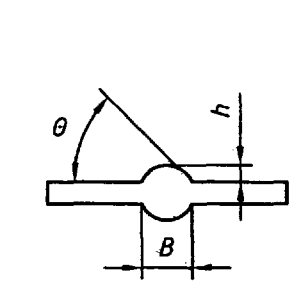
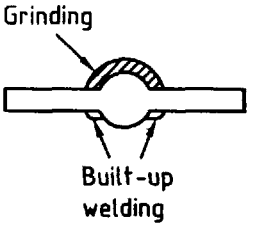
Items		Standard range	Allowable limits	Remarks
Deviation between centrelines of	double-bottom sub-assembly and shipway/dock	$\leqslant 3{,}0$	$\leqslant 5{,}0$	
	deck, platform, transverse bulkhead and double bottom	$\leqslant 5{,}0$	$\leqslant 8{,}0$	
	fore and aft terminal points and shipway/dock	$< h/1\,000$	$< 1{,}5\ h/1\,000$	h is the height of fore/aft terminal
	superstructure and deck	$\leqslant 4{,}0$	$\leqslant 8{,}0$	
	upper rudder carrier and shipway/dock	$\leqslant 4{,}0$	$\leqslant 8{,}0$	
	stern shaft hole and shipway/dock	$\leqslant 5{,}0$	$\leqslant 8{,}0$	
Levelness or planeness	levelness at four corners of bottom, platform and deck	$\pm 8{,}0$	$\pm 12{,}0$	
	planeness of bulkhead (port/starboard, fore/aft)	$\pm 4{,}0$	$\pm 6{,}0$	
	planeness of side sub-assembly (fore/aft)	$\pm 5{,}0$	$\pm 10{,}0$	
	levelness at four corners of superstructure	$\pm 10{,}0$	$\pm 15{,}0$	
Height of positioning	bulkhead	$\pm 3{,}0$	$\pm 6{,}0$	
	side sub-assembly	$\pm 5{,}0$	$\pm 8{,}0$	
	superstructure	$+ 10{,}0$	$+ 15{,}0$	
Frame spacing at sub-assembly joint		$\pm 10{,}0$	$\pm 20{,}0$	
Perpendicularity of bulkhead		$< h/1\,000$ and $< 10{,}0$	$< 1{,}2\ h/1\,000$ and $< 12{,}0$	h is the height of bulkhead

5.6 Welding

5.6.1 The deviation of welding dimensions shall be kept within the limits given in Table 28.

Table 28 — Deviation of welding bead dimensions

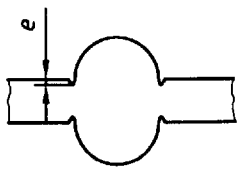
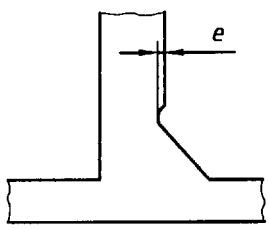
Dimensions in millimetres

Items			Standard range	Allowable limits	Remarks
Height of reinforcement of weld, h			$h \leqslant 0{,}2$ B	$h \leqslant 0{,}3$ B max. 6 mm	
	General		$\theta \leqslant 60°$	$\theta < 90°$	
Flank angle, θ	Butts on deck, bottom and primary strength members		—	$\theta \leqslant 60°$	

5.6.2 The weld undercut shall be in compliance with the requirements given in Table 29.

Table 29 — Weld undercut

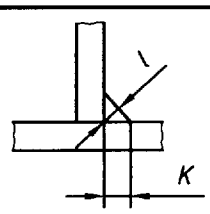
Dimensions in millimetres

Items	Standard range	Allowable limits	Remarks
Butt weld 	—	For main structures such as shell plate, deck, longitudinal girders, etc. within 0,6L amidship. $e \leqslant 0{,}5$ For others: $e \leqslant 0{,}8$	(1) If e is between 0,5 and 0,8, the sharp cutting edge shall be repaired even if angle of undercut is larger than 90° for the case of undercuts continuous for at least 90 mm. (2) The sharp configuration of fillet weld shall be repaired.
Fillet weld 	—	$e \leqslant 0{,}8$	

5.6.3 The deviation of dimensions of fillet welds shall be kept within the limits given in Table 30.

Table 30 — Deviation of dimensions of fillet welds

Dimensions in millimetres

Items		Standard range	Allowable limits	Remarks
Specified dimension of fillet, K Actual dimension of fillet, K_a Specified throat depth, l Actual throat depth, L_a		—	$K_a \geqslant 0{,}9K$ $L_a \geqslant 0{,}9l$	Where the fillet or throat depth are not within allowable limits, they shall be corrected by further welding using small electrodes.

5.6.4 The short bead, tack-welding bead and repairing bead shall be in compliance with the requirements given in Table 31.

Table 31 — Short bead, tack-welding bead and repairing bead

Dimensions in millimetres

Items			Standard range	Allowable limits	Remarks
Bead length	500 MPa high-tensile steel	Ceq > 0,36 %	—	$\geqslant 50$	When the bead length is less than the allowable limits, it is necessary to preheat at (100 ± 25) °C
		Ceq $\leqslant$ 0,36 %	—	$\geqslant 10$	
	Grade E mild steel		—	$\geqslant 30$	

5.6.5 The arc-strike shall be in compliance with the requirements given in Table 32.

Table 32 — Arc-strike

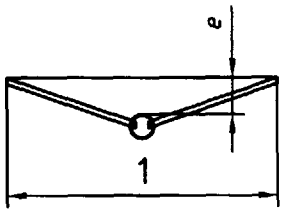
Dimensions in millimetres

Items	Standard range	Allowable limits	Remarks
50 MPa high-tensile steel, Grad E mild steel, cast steel	—	Not allowed	When an arc-strike was made, it is required to do repairs as below: a) Weld over a short bead over 50 mm on the arc-strike b) Remove the hardened zone by grinding.

5.6.6 The welded joint distortion shall be kept within the limits given in Table 33.

Table 33 — Welded joint distortion

Dimensions in millimetres

Items		Standard range	Allowable limits	Remarks
Shell plate within 0,6L amidship, e	 e is distortion of shell plate in a frame span **Key** 1 Frame spacing	—	⩽ 6	When it exceeds allowable limits, it shall be repaired or rewelded after correcting or cutting.
Shell plate at fore and aft, e		—	⩽ 7	
Others, e		—	⩽ 8	

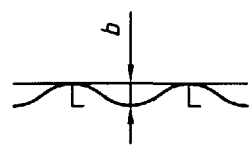
5.7 Flatness and finishing

5.7.1 Flatness

5.7.1.1 Local flatness shall be in compliance with the requirements given in Table 34.

Table 34 — Local flatness

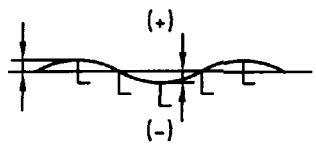
Dimensions in millimetres

Items		Standard range	Allowable limits	Remarks
Shell plate	Parallel midbody (side plate, bottom plate)	4	6	 b is the flatness for every frame spacing
	Sub-assembly of parallel midbody (side plate, bottom plate)	4	6	
	Fore and aft curved parts	5	7	
	Joints at fore and aft parts	6	8	
Double bottom	Tank top plate	4	6	
Bulkhead		6	8	
Upper deck	Parallel midbody (including longitudinal and transverse structure)	4	6	
	Fore and aft parts	6	9	
	Non-exposed part	7	9	
Second deck	Exposed part	6	8	
	Non-exposed part	7	9	
Superstructure deck	Exposed part	4	6	
	Non-exposed part	7	9	
House walls	Exposed part	4	6	
	Both sides of non-exposed part	7	9	

5.7.1.2 Overall flatness shall be in compliance with the requirements given in Table 35.

Table 35 — Overall flatness

Dimensions in millimetres

Items		Standard range	Allowable limits	Remarks
Shell plate	Parallel midbody	± 2 l/1 000	± 3 l/1 000	Measuring method: Minimum measuring length l = 3 000 but about 5 000 for bulkhead and outside wall 
	Fore and aft parts	± 3 l/1 000	± 4 l/1 000	
Deck and tank top		± 3 l/1 000	± 4 l/1 000	
Bulkhead		± 4 l/1 000	± 5 l/1 000	
Superstructure	Deck	± 3 l/1 000	± 4 l/1 000	
	Outside wall	± 2 l/1 000	± 3 l/1 000	
Others		± 5 l/1 000	± 6 l/1 000	

5.7.1.3 The deviation from the straight line related to the length of inner stiffeners shall be in compliance with the requirements given in Table 36.

Table 36 — Straightness of inner stiffeners

Dimensions in millimetres

Items	Standard range	Allowable limits
Principal members, such as deck transverse, deck girder, web frame, floor and girder, etc.	5	8
Other members, such as longitudinal, frame, beam and stiffener, with length l:	$3+\frac{2l}{1000}$	$6+\frac{2l}{1000}$
"H" type pillar between decks	4	6
Cross tie	6	10

5.7.2 Finishing

5.7.2.1 Staging sockets and lifting eyepieces shall be finished according to the requirements given in Table 37.

Table 37 — Staging sockets and lifting eyepieces

Dimensions in millimetres

Items		Requirements	Remarks
Staging sockets	In water and oil tanks	May be retained totally	(1) After removing those lifting eyepieces which affect appearance and passage, the surface shall be finished as flush as the base plate. (2) Such pieces may be removed by gas cutting at other places, root may be retained, but for those parts, especially important to strength, built-up welding shall be made to smooth and flush after cutting
	In engine room	Only those affecting appearance and passage shall be removed	
	In cargo hold	Only those at lower level and on hatch coaming shall be removed	
	On exposed part of shell and upper deck, etc.	To be removed totally	
Lifting eye pieces	In water and oil tanks	May be retained provided not affecting passage	
	In cargo hold	10 mm of root may be retained on back side of deck plate	
	On exposed part of shell and upper deck, etc.	To be removed totally	Except fixed eyepieces

5.7.2.2 Temporary pieces shall be finished according to the requirements given in Table 38.

Table 38 — Temporary pieces

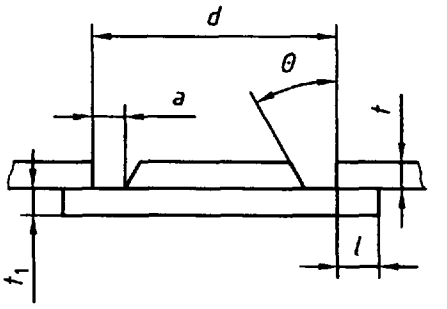
Dimensions in millimetres

Items	Requirements	Remarks
Where good appearance is required	Outside surface of shell plate, deck and superstructure shall be chipped flush and smooth. Undercut of temporary pieces may have a depth of 0,5 mm. Above this limit, the cut shall be welded over and ground flush.	Temporary pieces must be avoided on sheer strake and corner plates as far as possible. Any notches due to removal operations must be built up and ground flush.
Where good appearance is not required	Temporary pieces inside holds and similar places shall be chipped off if they are at particularly conspicuous places. Undercut may have a depth of 0,5 mm to 1,0 mm and a length not more than 30 mm. Over these limits, they shall be welded over and finished, but may not be chipped and ground.	

5.7.2.3 Holes made erroneously shall be treated according to the requirements given in Table 39.

Table 39 — Holes made erroneously

Dimensions in millimetres

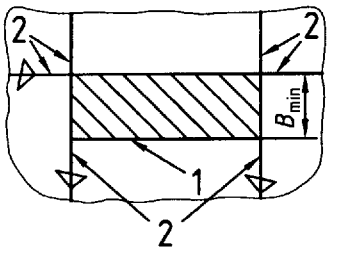
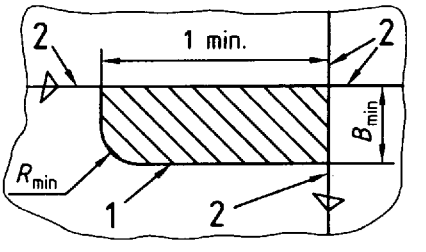
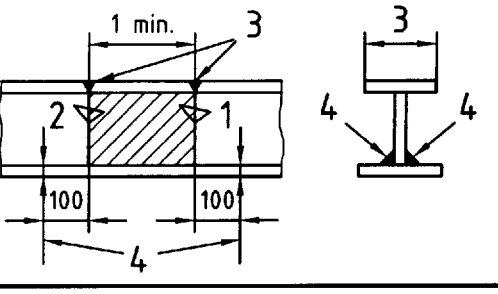
<table>
<tr><th colspan="2">Items</th><th>Allowable limits</th><th>Method of treatment</th></tr>
<tr><td rowspan="2">$d < 200$</td><td>Main strength members on shell plate or upper deck</td><td>(1) Cut an opening over 75 in diameter, then treated by method A.
(2) Cut an opening over 200 in diameter, then treated by method B</td><td rowspan="5">A: Spigot patch
 

$l = 50$
$a = 4$ to 6
$t_1 = 0{,}5t$ to $1t$
$\theta = 30°$ to $40°$
B: Repair and weld by insert plate
C: Built up and repair welded by doubler (to same thickness as base plate)
D: If it is difficult from the structural point of view to cut an opening over 200 in diameter, it may be processed by a low-hydrogen electrode after preheating followed by radiographic examination or ultrasonic inspection.</td></tr>
<tr><td>Others</td><td>Cut an opening over 200 in diameter, then treated by method B, C or D</td></tr>
<tr><td rowspan="2">$d \geqslant 200$</td><td>Main strength members on shell plate or upper deck</td><td>Treated by method B</td></tr>
<tr><td>Others</td><td>Treated by method B or C</td></tr>
<tr><td colspan="2">Triangular opening, scallop, rectangular opening</td><td>Treated by method B or C</td></tr>
</table>

5.7.2.4 Repairing by an insert piece shall be done according to the requirements given in Table 40.

Table 40 — Repairing by insert piece

Dimensions in millimetres

Items		Allowable limits	Method of treatment
Repair welding by insert piece	Minimum length of insert piece, l_{min}	300	  (1) Seam with insert piece shall be welded first. (2) Original seam shall be welded over at least for 100. (3) R is 5 times the plate thickness, minimum radius is 75.
	Minimum breadth of insert piece, B_{min}	300	
	Minimum roundness of insert piece, R_{min}	5 times plate thickness, but ⩾ 75	
Repair welding by insert piece for composite unit	Minimum length of insert piece, l_{min}	300	Welding procedure: 1 → 2 → 3 → 4 

5.8 Principal dimensions and deformation

5.8.1 The deviation of principal dimensions shall be kept within the limits given in Table 41.

Table 41 — Deviation of principal dimensions

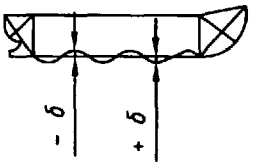
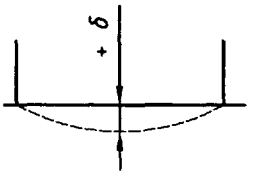
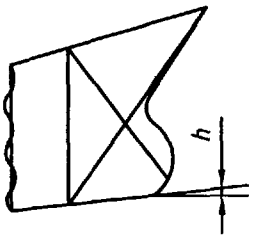
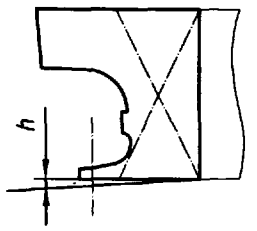
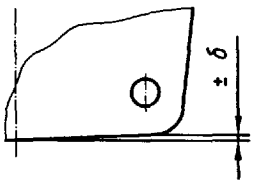
Dimensions in millimetres

Items	Standard range	Allowable limits
Overall length, L_{oa}	± L_{oa} /1 000	± 1,25 L_{oa} /1 000
Moulded breadth, B	± B/1 000	± 1,25 B /1 000
Moulded depth, H	± H /1 000	± 1,25 H /1 000

5.8.2 The deformation of hull form shall be kept within the limits given in Table 42.

Table 42 — Deformation of hull form

Dimensions in millimetres

Items			Standard range	Allowable limits
Deflection of base line	Within whole length between fore and aft peak tanks		± 25	± 35
	Between adjacent transverse bulkheads		± 15	± 20
Cocking-up	Cocking-up of bow		± 30	± 40
	Cocking-up of stern		± 20	± 30
	Transversely warping-up or sagging-down		± 15 (per 10 m of breadth)	± 25 (per 10 m of breadth)

5.9 Draught and freeboard

5.9.1 The deviation of draught shall be kept within the limit given in Table 43.

Table 43 — Deviation of draught

Dimensions in millimetres

Items	Standard range	Allowable limits
Deviation in regard to the straight ruler	± 1,0	± 2,0

5.9.2 The deviation of freeboard shall be kept within the limit given in Table 44.

Table 44 — Deviation of freeboard

Dimensions in millimetres

Items	Standard range	Allowable limits
Deviation in regard to the template	± 1,0	± 1,0

5.10 Coating

5.10.1 Pretreatment of steel surface

5.10.1.1 The pretreatment of the steel surface shall be performed in accordance with the requirements given in Table 45.

Table 45 — Pretreatment of steel surface

Items			Standard range	Allowable limits	Remarks
Shot blasting	Steel plate of $t \geqslant 6$ mm	Cleanliness	—	Sa 2.5 class	ISO 8501-1
		Roughness	—	Medium class	ISO 8503-1
	Steel sections of $t \geqslant 4$ mm	Cleanliness	Sa 2.5 class	Sa 2 class	ISO 8501-1
		Roughness	—	Medium class	ISO 8503-1
Pickling	Steel plate of $t \leqslant 6$ mm Steel sections of $t \leqslant 4$ mm Steel pipe of any size	Cleanliness	—	No scale, no rust, no grease, no dirt	ISO 8501-1
Abrasive blasting	Steel plate of any size Steel sections of any size	Cleanliness	—	Sa 2.5 class	ISO 8501-1
		Roughness	—	Medium class	ISO 8503-1
	Steel pipe with diameter $\varphi \geqslant 200$ mm (with interior coating requirement)	Cleanliness	Sa 2.5 class	Sa 2 class	ISO 8501-1
		Roughness	—	Medium class	ISO 8503-1
	Block structure	Cleanliness	—	Same as for primer touch-up in Table 47	ISO 8501-1
		Roughness	—	Medium class	ISO 8503-1

5.10.1.2 The application of shop primer shall be in accordance with the requirements given in Table 46.

Table 46 — Application of shop primer

Dimensions in micrometres

Items		Standard range	Allowable limits	Remarks
Type of coating	Zinc primer Non-zinc primer	—	—	Approved by classification society in accordance with coating scheme approved by shipowner
Film thickness	Zinc primer	13 to 18	$\geqslant 12$ $\leqslant 30$	
	Non-zinc primer	20 to 25	$\geqslant 18$ $\leqslant 40$	

5.10.2 Second derusting

Cleanliness after second derusting shall be in compliance with the requirements given in Table 47.

Table 47 — Cleanliness after second derusting

Items				Standard range	Allowable limits [a]	Remarks
Position		Coating type	Surface treatment			
Shop primer damaged area, such as weld area, line and spot heating area and naturally exposed area	Shell plating and exterior exposed location	Conventional coatings,[a] chlorinated rubber coating	Abrasive blasting	—	Sa 2 class	ISO 8501-1
			Power tool	—	St 2 to 3 class	ISO 8501-1
		Epoxy resin coating, vinyl resin coating, polyurethane coating	Abrasive blasting	—	Sa 2.5 class	ISO 8501-1
			Power tool	—	St 3 class	ISO 8501-1
		Epoxy-tar coating	Abrasive blasting	—	Sa 2 class	ISO 8501-1
			Power tool	—	St 3 class	ISO 8501-1
		Inorganic zinc coating	Abrasive blasting	—	Sa 2.5 class	ISO 8501-1
	Interior space	Conventional coating,[b] chlorinated rubber coating	Abrasive blasting	—	Sa 2 class	ISO 8501-1
			Power tool	—	St 2 class	ISO 8501-1
		Epoxy resin coating, vinyl resin coating, epoxy-tar coating	Abrasive blasting	—	Sa 2 class	ISO 8501-1
			Power tool	—	St 2 to 3 class	ISO 8501-1
		Inorganic zinc coating	Abrasive blasting	—	Sa 2.5 class	ISO 8501-1
	Interior of liquid tank (excluding fuel tank)	Epoxy resin coating, vinyl resin coating, polyurethane coating, epoxy-tar coating	Abrasive blasting	—	Sa 2.5 class	ISO 8501-1 Ballast tank interior coating to be investigated for compliance with IMO A.798(19)
			Power tool	—	St 3 class	ISO 8501-1
		Inorganic zinc coating	Abrasive blasting	—	Sa 2.5 class	ISO 8501-1
	Fuel tank	Conventional coating [b]	Power tool	—	St 2 class	ISO 8501-1
Surface with intact shop primer	Hull surface	Any coating	Abrasive blasting Power tool	—	Remove powdery rust, grease and dirt	

[a] Sa and St are defined in ISO 8501-1.

[b] Conventional coatings include oil-based coating, oil-modified synthetic resin based coating and bituminous coating. For the fuel oil tank and lubrication oil tank, conventional coatings imply those temporary protective coatings based on petroleum resin and castor oil and conventional shop primer. When phenolic coating is used for the potable water tank, the quality control requirements shall be the same as those for the application of epoxy resin coating.

5.10.3 Surface cleaning

Surface cleaning before coating shall be performed in accordance with the requirements given in Table 48.

Table 48 — Surface cleaning before coating

Items			Standard range	Allowable limits
Moisture	Before applying any coating		Remove	Invisible to naked eye
Salt	Before applying any coating		Remove	Invisible to naked eye
Grease	Before applying inorganic zinc coating		Remove	Invisible to naked eye
	Before applying coatings other than inorganic zinc coating		Remove	With trace remained
Dust	Before applying any coating		Remove	With trace remained
Zinc salt	Before applying inorganic coating		Remove	With slight trace remained
	Before applying coatings other than inorganic zinc coating		Remove	With trace remained
Dust of gas cutting and welding	Before applying inorganic zinc coating		Remove	With slight trace remained
	Before applying coatings other than inorganic zinc coating		Remove	With trace remained
Chalk marking	Before applying inorganic zinc coating		Remove	With slight trace remained
	Before applying chlorinated rubber coating, epoxy resin coating, vinyl resin coating and polyurethane resin coating		Remove	With trace remained
	Before applying conventional coating		—	Basically cleaned
Coating marking	Before applying inorganic zinc coating		Remove	With slight trace remained
	Before applying chlorinated rubber coating, epoxy resin coating, vinyl resin coating and polyurethane resin coating	In case the marking coating is of the same colour	—	No need to remove
		In case they are different in colour	Remove	With trace remained
	Before applying conventional coating		—	No need to remove

5.10.4 Quality of coating

The quality of the coating shall be in compliance with the requirements given in Table 49.

Table 49 — Quality of coating

Items			Standard range	Allowable limits
Surface with high decoration requirement (exterior surface of superstructure, exposed surface of wheelhouse, accommodation cabins and interior passage)	Defect	Miss-out coating, bubble cavity, crackle, dry particles of coating	None	None
		Flow-trace, brush mark, ripple	None	Slight
	Colour		In conformity with owner requirement	—
Surface with certain decoration requirement (shell plating, exposed deck, engine room and stores)	Defect	Miss-out coating, bubble cavity, crackle, flow-trace, ripple	None	Slight
	Colour		Not obviously different from owner requirement	Slight
Surface without decoration demand (such as cargo hold, tank, void space and cofferdam, etc.)	Defect	Miss-out coating, bubble cavity, crackle, flow-trace, ripple	None	Slight

5.10.5 Film thickness of coating

The film thickness of coating shall be in compliance with the coating specification. The deviation of the thickness of the film shall be in compliance with the requirements given in Table 50.

Table 50 — Film thickness of coating

Items		Standard range	Allowable limits
Distribution of film thickness	Film thickness of over 80 % measured points	—	Up to required thickness
	Film thickness of remaining measured points	—	Up to 80 % required thickness

6 Hull construction reports

The following reports of hull construction shall be submitted by the shipbuilder to the ship owner and classification society:

a) report of material for main structural members including plates and sections;

b) report of non-destructive inspection;

c) report of tightness test;

d) report of measurement of principal dimensions;

e) report of derusting and coating (owner only).

7 Documentation on board

The following documents shall be kept on board for the lifetime of the ship:

a) shipbuilder's reports specified in subclause 6;

b) Interim Classification Certificate for Hull;

c) Classification Certificate for Hull;

d) Report and Record on Classification Survey for Hull, Machinery & Electrical Equipment and Refrigerated Cargo Installation. (Part A Hull and Equipment);

e) Report of Outstanding Recommendation (if any);

f) International Load Line Certificate (1966);

g) International Load Line Exemption Certificate (if any);

h) International Convention on Load Line, 1966, Record of Condition of Assignment;

i) Cargo Ship Safety Construction Certificate;

j) Loading Manual Booklet.

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