

CHINA SHIPBUILDING QUALITY STANDARD

CSQS

1998



CHINA STATE SHIPBUILDING CORPORATION

CHINA SHIPBUILDING
QUALITY STANDARD

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1998

REVISING TEAM OF
CHINA SHIPBUILDING QUALITY STANDARD



Approved by CHINA STATE SHIPBUILDING CORPORATION
Effective as from OCTOBER 1, 1998

STANDARDS PRESS OF CHINA

In order to meet the growing needs of market economy, to promote the development of China's maritime industries and shipping, to ensure product quality, and to fulfill the requirements of marketing, trading, designing and production in shipbuilding industries, China State Shipbuilding Corporation (CSSC) sponsored and organized the drafting of this *CHINA SHIPBUILDING QUALITY STANDARD* (CSQS).

This Standard is approved by China State Shipbuilding Corporation for being exercised in China's shipbuilding industries.

The Standard is developed on the basis of the practical experience and research achievements obtained through many years of practice in the past by the Chinese shipbuilding industries and international regulations and conventions with due consideration to the rules of international major classification societies, and similar shipbuilding quality standards of leading shipbuilding countries. The Standard reflects in fact the state-of-the-art of the technology of the shipbuilding industry of China.

With the purpose of ensuring proper performance, strength and safe operation of the ship designed and constructed, the Standard specifies the requirements on ship quality control through production process, on the scope and items of plan submission, inspection and testing and on the detailed construction, accuracy. It provides a guideline of quality criteria for coordination among shipowners, classification societies, designers and shipbuilders.

The Standard applies mainly to the conventional sea-going steel ships of 3 000 tonne deadweight and above. Special technical requirements concerning special types of ship are not incorporated in this Standard.

① CHINA SHIPBUILDING QUALITY STANDARD

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Publisher, Standards Press of China

Samtne, Fuzhai, Beijing, China, 100045

图书在版编目 (CIP) 数据

中国造船质量标准: C/SQS 1998/《中国造船质量标准》
修订小组. —北京: 中国标准出版社, 1998. 11

ISBN 7-5066-1758-7

I. 中... II. 中... III. 造船工业-质量标准-中国-1998
R. U 96-55

中国标准出版社第 CIP 数据核字 (98) 第 27939 号

中国标准出版社出版

北京复兴门外大街二里河北街16号

邮政编码: 100045

电话: 68522112

中国标准出版社激光照排印刷

版权专有 不得翻印

开本 880×1230 1/32 印张 9.75 字数 245 千字
1998年12月第一版 1998年12月第一次印刷

印数 1—1 000

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and shall be additionally adapted in case of need. The Standard may also be used as a reference for ships under 3 000 tonne deadweight.

The Standard is composed of three parts. The first part deals with the quality control through production and covers 12 processes of steel material and processing, fixing and assembling, welding, lightning test, pipe processing, fixing, tightness test and flushing, painting, hull outfitting, machinery installation, electric installation, equipment and testing of automatic control and remote-control remote-measuring systems, mooring test and sea trial, and final completion and delivery of the ship. The second part lists the names of drawings and documents that shall be submitted for review and approval by the classification society and shipowner, and the inspections and testings that shall be carried out. The third part specifies the accuracy standards for ship building, which includes hull construction, outfitting, machinery installation, electric installation and painting.

Under the sponsorship and organization of the China State Shipbuilding Corporation, the Standard is drafted and compiled by the experts from Dalian Shipyard, Dalian New Shipyard, Bohai Shipyard, Hudong Shipyard, Jiangnan Shipyard, Quxin Shipyard, Shanghai Shipyard, Zhonghua Shipyard, Donghai Shipyard, Guangzhou Shipyard, CSSC Technology Research and Economic Development Institute and CSSC Shipbuilding Technology Research Institute. The Drafting and Editing Committee has also sent the draft to a number of experts and specialists of relevant shipyards, academies, research institutes and companies and organizations as well as maritime people outside CSSC scope for their comments and suggestions.

CSSC reserves the right to make modification to this Standard.

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March, 1993

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modified with terminology unification done to some special technical terms.

it can be expected that updating or further revising may be done regularly to CSQS. The revising team welcomes any comments or suggestions on the Standard to keep it sound and perfect.

REVISING TEAM
March, 1998

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PART I

QUALITY CONTROL THROUGH PRODUCTION

1 STEEL MATERIAL AND PROCESSING

1.1 Steel material

1.1.1 Upon arrival in the yard, all marine steel materials are to be checked against quality certificates. Visual inspection is to be done to confirm their quality.

1.1.2 All steel materials are to be stowed in pile according to sizes and brand and kept flat.

1.1.3 All steel materials shall be served out against material allocation sheet according to the production plan.

1.1.4 Visual inspection is to be done to the steel materials before processing.

1.1.5 Key points of quality control :

- a) size, brand, heat number, batch number ;
- b) minus tolerance in thickness for plates and sections ;
- c) surface qualities ;
- d) any defects in large forgings and castings.

1.2 Steel processing

1.2.1 Marking and cutting

1.2.1.1 Necessary pre-treatment such as levelling, straightening and derusting are to be done to the plates and sections before cutting.

1.2.1.2 Numerical controlled cutting and other high efficient high-precision cutting means are to be used as far as possible to improve

marking and cutting accuracy.

1.2.1.3 Material properly heat number, batch number and thickness are to be noted down for primary members according to the requirement.

1.2.1.4 Key points of quality control for marking:

- a) size deviation;
- b) angular deviation;
- c) markings such as processing symbols, codes and marks.

1.2.1.5 Key points of quality control for cutting:

- a) cutting accuracy;
- b) dimensional size;
- c) deformation.

1.2.2 Forming

1.2.2.1 Bending

Forming by cold or hot bending of steel plates and sections is to be performed according to the specified requirements for materials of different properties and grades.

1.2.2.2 Key points of quality control:

- a) heating temperature;
- b) accuracy of forming.

2 FIXING AND ASSEMBLING

2.1 Fixing and assembling of parts and members

2.1.1 The accuracy requirements of block assembling is to be met for the fixing and assembling of parts and members. Shop primer is to be applied after welding.

2.1.2 Key points of quality control:

- a) geometrical dimensions of parts and members;
- b) installation locations;
- c) deformation.

2.2 Block assembling

2.2.1 Block assembling is to be generally carried out on the platform or jig.

2.2.2 Pre-cutting of parts and members is to be done according to the design drawings.

2.2.3 The accuracy that meets the requirements of general assembling is to be applied for block assembling.

2.2.4 Block assemblies are to be painted after inspection.

2.2.5 Key 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) levelling of base plate and location deviation of main engine bed;
- g) installation locations of key components, such as shaft boss, rudder horn, etc;
- h) accuracy of jig manufacturing.

2.3 Erection on shipway

2.3.1 Carry out marking on the shipway with corresponding symbols and marks.

2.3.2 Place the reference block in position, and then proceed with successive blocks according to the shipway assembling schedule.

2.3.3 Carry out erection on shipway.

2.3.4 During construction process, all temporary openings in the primary members and their closing-up are to comply with the requirements set out in the technical documents.

2.3.5 Remove temporary welding pieces and lifting eye pieces

according to usual practice.

2.3.6 After completing showway assembling, the hull is to be parried according to the specified requirements.

2.3.7 Key points of quality control:

- a) accuracy of marking on the showway;
- b) correctness of location of the reference block;
- c) frame spacing at block junctions;
- d) alignment accuracy of structural members;
- e) deflection of the centerline of the keel;
- f) alignment accuracy of shaft centerline;
- g) marking accuracy of leadline and draft marks;
- h) principal dimensions of the hull.

3 WELDING

3.1 Preparation before welding

3.1.1 Welding materials, preparation of weld joints and assembling accuracy are to comply with relevant requirements set out in quality control documents.

3.1.2 The welding zones to be free of rust, scales, grease, moisture or other dirt.

3.1.3 The environmental condition of the welding area is to be kept in good order.

3.1.4 Tack welding is to be carried out according to specified technological procedures.

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

3.2 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 are to be taken.

3.3 Welding inspection

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

3.3.2 All welds are to be visually examined first.

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

3.3.4 Leg sizes of fillet welds are to comply with the design plan and relevant codes.

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

3.3.6 Welds not conforming to the requirements of quality standards are to be rectified and repaired as required, and are to be inspected again.

3.4 Key points of quality control

- a) qualification of welders;
- b) welding materials;
- c) welding codes;
- d) groove sizes and seam clearance;
- e) cleanliness 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 TIGHTNESS TEST

4.1 Tightness test is to be conducted after main hull and the structure to be tested are completed, all accessories affecting the tightness are fixed and non-destructive testing are properly completed.

4.2 All welding seams having concern with tightness test are to be free of scales, slugs, paints(excluding primers) or any grease.

4.3 Tightness test to the hull structure may be performed with either hose test, hydraulic test, air test or other equivalent methods depending upon the hull strength and tightness requirement.

4.4 Tightness test may be performed on blocks.

4.5 The location and requirements for tightness test are to be in compliance with the requirements of the classification society.

4.6 Key points of quality control:

- a) cleaning of welded seams;
- b) test pressure;
- c) test procedure;
- d) test duration;
- e) inspection for deformation and leakage.

5 FABRICATION, FIXING, TIGHTNESS TESTING AND FLUSHING OF PIPES

5.1 Fabrication of pipes

5.1.1 Material of pipes

5.1.1.1 Upon arrival in the yard, visual inspection is to be conducted to the pipes against technical documents. The pipes are to be properly stored separately according to their material

quality, heat number, batch number, grade and size.

5.1.1.2 Key points of quality control:

- a) certificate of qualification;
- b) size and visual appearance;
- c) separate stowing.

5.1.2 Blanking of pipes

5.1.2.1 Before blanking, check is to be made to the pipe size, grade, material quality, heat number and batch number. After blanking and temporary sealing, the pipe sections are to be properly numbered and stowed in accordance with technical document.

5.1.2.2 Key points of quality control,

- a) size and visual appearance;
- b) blanking length and serial number;
- c) stowing and maintenance.

5.1.3 Bending of pipes

5.1.3.1 Either cold bending or hot bending may be used for pipe bending. In case of cold bending, the bending radius of the curvature of the pipe is to be in general not less than three times the outside diameter of the pipe. For special pipes such as tank heating pipe and pipes to be fixed in confined space, the radius of curvature is to be in general not less than two times the outside diameter of the pipe. When pre-fabricated bend is adopted, the bending radius of the curvature is to be not less than the outside diameter of the pipe.

5.1.3.2 Key points of quality control:

- a) circularity of the pipe band;
- b) height of bending corrugation of the pipe band;
- c) mechanical damage or defect;
- d) bend angle, rotating angle and length of pipe segment after bending.

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5.1.4 Fixing of pipes

5.1.4.1 The material, size and type of pipe fittings are to be in compliance with the requirements of the technical documents. The mating clearance or groove of the pipe with its connector, of the branches with main pipe and between connection bulbs of pipes are to be in conformity with the relevant technical requirements.

5.1.4.2 Key points of quality control;

- a) marks of pipe;
- b) correct use of connector;
- c) mating clearance and groove;
- d) assembling dimensions;
- e) position welding.

5.1.5 Welding of pipes

5.1.5.1 The welder shall hold proper qualification certificate for conducting welding. Measures are to be taken to avoid deformation of the welding for large diameter pipe. Welding is to be carried out in accordance with the requirements of the welding procedures.

5.1.5.2 Key points of quality control;

- a) cleaning of welded parts;
- b) welding material;
- c) welding deformation;
- d) welding quality.

5.1.6 Pipe cleaning and strength testing

5.1.6.1 The pipes are to maintain smooth surface after machining and welding, and are subject to hydraulic test in accordance with the requirements of the technical documents.

5.1.6.2 Key points of quality control;

- a) no welding slag, spray, sharp cut nor burr on the surface;
- b) strength test;

- c) seal blocking of pipe ends.

5.1.7 Surface treatment of pipes

5.1.7.1 After machining, pipe surface is to be treated in accordance with the requirements of the technical documents. Pipes with different surface treatment shall be segregated and stored separately.

5.1.7.2 Key points of quality control;

- a) cleaning and protection of pipes;
- b) quality of galvanizing and painting;
- c) storing of pipes after surface treatment.

5.2 Fixing of pipes and fittings

5.2.1 Handling of pipes

5.2.1.1 Pipes to be installed are to be counted and stored out in accordance with the technical documents.

5.2.1.2 Key points of quality control;

- a) protection of non-errors and specially treated pipes;
- b) prevention of impact or squeezing;
- c) prevention of sand or dirt from entering the pipe.

5.2.2 Fixing of pipes

5.2.2.1 Pipes, in general, are to be fixed in stages of unit assembling, block assembling, overall assembling and fixing on board.

5.2.2.2 Key points of quality control;

- a) fixing sequence and accuracy of coordinate dimensions;
- b) cleaning of pipe and mating surface and removal of foreign matters inside the pipe;
- c) size and material quality of pipe connection bolt;
- d) seating material for pipe connection;
- e) connecting accuracy of pipe to equipment.

5.2.3 Fixing of pipe fittings and supports

5.2.3.1 The fixing of pipe fittings and supports is to be in compliance with the requirements of the classification society.

5.2.3.2 Key points of quality control;

- a) type, size, position and flow direction of pipe fittings;
- b) visual quality of fittings;
- c) connecting accuracy of pipe to the equipment;
- d) supporting type and spacing of supports;
- e) welding of support;
- f) gasket between non-ferrous pipe and support.

5.3 Tightness testing of piping system

5.3.1 Tightness test to the piping system is to be carried out in accordance with the technical documents.

5.3.2 Key points of quality control;

- a) completeness and accuracy of pipe fixing;
- b) testing medium;
- c) testing method;
- d) tightness.

5.4 Flushing of pipes

5.4.1 Flushing of the piping systems is to be carried out in accordance with the requirements of the technical documents.

5.4.2 Key points of quality control;

- a) flushing medium;
- b) flushing method;
- c) cleanliness.

6 PAINTING

6.1 Pre-treatment of steel surface

6.1.1 Surface pre-treatment of steels is to be done in general

by means of shot-blasting, abrasive blasting and chemical cleaning. Shop primer is to be coated after derusting.

6.1.2 Surface pre-treatment is to be done to the quality standard listed in table 3-5-1 of this standard.

6.1.3 Shop primer is to be applied to the quality standard stated in table 3-5-2 of this standard.

6.2 Shop primer touch-up

Any damaged shop primer is to be duly touched up during processing, assembling and welding.

6.3 Secondary derusting and surface cleaning

Secondary derusting and surface cleaning are to be done to the quality standard stated in table 3-5-3 and table 3-5-4 of this standard.

6.4 Painting work

6.4.1 Pre-painting

Pre-painting is to be done for the spots and areas that can not be easily accessed or difficult to reach the required film thickness by spraying.

6.4.2 Painting

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

6.4.3 Key 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.

7 HULL OUTFITTING

7.1 Pre-outfitting of ship equipment

Pre outfitting is to be carried out as extensive as practically possible depending upon the conditions of construction.

7.2 Approval of ship equipment

All ship equipment such as hatch-covers, closing appliances for windows and doors, air-conditioning system, fire-fighting system are to have the marine product certificates issued by the classification society, product qualification and test reports.

7.3 Installation of ship equipment

All ship equipment are to be completely and correctly installed.

7.4 Key points of quality control

7.4.1 Steering equipment

- a) machining accuracy of all fitting faces;
- b) machining accuracy and mating gaps for rudder stock, rudder plate, tiller, rudder carrier, rudder pintle and inner;
- c) location deviations of various centerlines of rudder system;
- d) correct zero position of rudder blade;
- e) installation precision of the steering gear.

7.4.2 Anchoring equipment

- a) installation precision of the winchless;
- b) smooth engagement of anchor chains with chain wheel;
- c) braking ability of chain stopper;
- d) mating of anchor to anchor lips.

7.4.3 Mooring equipment

- a) precision of installation;
- b) ease of operation.

7.4.4 Lifepoint davits

- a) strength of boat davits;

- b) the part of boat extending overboard;

- c) clear observation of boat-lowering and hoisting from the boat handling station;

- d) distance between boat and side shell when lowering, smoothness of boat lowering;

- e) simultaneous de-hooking when the boat is afloat;

- f) correct installation of boat winches and accessories.

7.4.5 Accommodation ladder

- a) strength of ladder;

- b) easy and reliable lowering, hoisting and turning over.

7.4.6 Cargo gear

- a) fabrication accuracy of derricks and derrick post;

- b) levelness and flatness of derrick post flanges and crane seat;

- c) precision of cargo winch installation;

- d) braking reliability;

- e) loading test of cargo gear.

7.4.7 Cargo hold hatchcovers and hatch coamings

- a) accuracy of sizes and shapes: installation accuracy of water-tight rubber seals and the channels;

- b) precision of position limiting;

- c) fitness between securing wedges and wedge seats;

- d) flatness of face plates on hatch coaming; difference between diagonals of hatch;

- e) location of battens on hatch coaming;

- f) water-tightness of hatchcovers;

- g) easy handling.

7.4.8 Steel weather-tight closing appliances

- a) visual quality after welding;

- b) tightness.

7.4.9 Air-conditioning system

- c) installation integrity and correctness of equipment, ducts and fittings;
- b) smoothness and tightness of ducts;
- c) running test to prove normal operation;
- d) effect of air-conditioning.

7.4.10 Fire-fighting system

- a) installation integrity and correctness of equipment, pipings and fittings;
- b) tightness of pipings;
- c) correct function and effectiveness of CO₂ or foam system;
- d) correct functioning of fire-detection and alarm system;
- e) releasing interlocking function.

8 MACHINERY INSTALLATION

8.1 Shafting and propeller

8.1.1 Machining and assembling of shafting

8.1.1.1 The materials of intermediate shaft, tail shaft and connection belt are to be in compliance with the requirements of the classification society and with the qualification certificate.

8.1.1.2 The cone end of the tail shaft is to be machined against the template.

8.1.1.3 For key-fixing propeller, the grind-fitting of the key with shaft and propeller keyways is to be carried out at the same time of the grind fitting of the propeller boss and shaft.

8.1.1.4 After machining, the reamed belt hole of the connection flange is to be matched with the reamed bolt by cold or hydraulic pressing for interface checking.

8.1.1.5 The intermediate shaft is to be assembled by grind-fitting to the intermediate bearing.

8.1.1.6 The propeller is to be assembled by grind fitting to the

propeller shaft. The mating position of the propeller and shaft is to be marked.

8.1.1.7 Key points of quality control:

- a) tolerance of template for tail shaft cone part machining and amount of deformation;
- b) accuracy of reamed hole of connection flange and centering deviation of flange;
- c) contact point and clearance of grind-fitting bearing bush;
- d) contact point and fixing tightness of grind-fitting key with shaft and propeller keyways;
- e) contact point and fixing tightness and assembling temperature of grind-fitting boss of keyless propeller with shaft;
- f) tightness test.

8.1.2 Centering and position fixing of shafting

8.1.2.1 The centering of the shafting is to be done in general by using the way of optical sight or running a line. The optical instrument used is to be accurate and in good condition and such centering is to be carried out at the time without direct sunshine.

8.1.2.2 Before conducting shafting centering, all hull construction around engine room fore bulkhead and below main deck or continuous strength deck are to be completed. The stern tube is to be centered, fixed and welded to completion based on ship's centerline duly surveyed and qualified.

8.1.2.3 During the process of shafting centering, any work that may cause severe vibration and lifting operation of heavy piece are to be forbidden.

8.1.2.4 After centering, check the vertical distance of the shafting center to the base plate of the foundation of main engine and to the base plate of bedding support of intermediate bearing, the deviation at fore and aft and the machining tolerance of the stern boss are to be checked.

8.1.2.5 Reference position for boring is to be defined.

8.1.2.6 Key points of quality control:

- a) deviation of center of boss at fore and aft ends;
- b) deviation of shafting centerline from the rudder stock centerline.

8.1.3 Boring of stern tube and machining of stern bush

8.1.3.1 The deviation of the center of the boring bar from the shafting center is to be kept within the specified range.

8.1.3.2 After completing boring of stern tube, the deviation of its centerline from the fore and aft reference center points is to be rechecked.

8.1.3.3 The external circle of the stern bush is to be machined in accordance with the actual size of the bush after boring.

8.1.3.4 Key points of quality control:

- a) flexibility of boring bar;
- b) roundness, cylindricity and coaxiality of fore and aft stern bearing holes;
- c) perpendicularity of end face of stern tube to the centerline;
- d) fixing interference of stern tube with stern bush;
- e) position mark of stern tube;
- f) surface roughness of stern bush.

8.1.4 Shafting installation on shipway

8.1.4.1 The stern tube is to be normally assembled and maintained with hydraulic pressing. Before pressing-in, the dimensions of mating parts of stern tube and bush are to be checked under the same temperature. During the pressing-in process, the pressing-in force is to be in compliance with the requirements of technical document.

Key points of quality control:

- a) accuracy of positioning of stern bush into the boss;
- b) temperature of stern tube and stern bush;
- c) variation of bearing internal diameter after pressing-in and sur-

face quality of babbitt metal;

d) pressing-in force.

8.1.4.2 Before assembling the tail shaft, the compactness of stern sealing device and correct assembling of the temperature sensor and conductor are to be checked.

Key points of quality control:

clearances of both fore and aft bearings.

8.1.4.3 The propeller is to be mounted by hydraulic pressing. After propeller mounting, the initial data of subsidence of the tail shaft sealing device is to be measured and marked.

Key points of quality control:

- a) temperature of tail shaft and propeller;
- b) initial pressing force, pressed-in amount and pressure;
- c) assembling tightness of propeller boss;
- d) gravity oil filling test for tail shaft sealing device.

8.1.5 Alignment and installation of shafting

8.1.5.1 Shafting alignment is to be carried out with main engine, shafting and accessories all located, with in general other large machines and equipment in engine room all properly positioned, and after the ship is launched.

8.1.5.2 The assembling dimensions of the shafting are to be adjusted from aft end forward according to the results of shafting alignment calculation, and the position of intermediate shaft and main engine are to be decided.

8.1.5.3 The grounded liners and reamer colts are to be assembled and tightly fastened.

8.1.5.4 After finishing of the shafting installation, load re-checking for the intermediate bearing is to be carried out in accordance with the loads specified in shafting alignment calculation.

8.1.5.5 Key points of quality control:

- a) deflection and offset of flange of each shaft;
- b) contact point of grind-fitting liner;
- c) surface roughness and mating accuracy of reamer bolt;
- d) clearance between mating surface after installing and fastening;
- e) load of intermediate shaft.

8.2 Main engine and accessories

8.2.1 Requirements to be followed for main engine positioning

8.2.1.1 Positions of bolt holes in the main engine foundation along the longitudinal direction are to be decided and machined.

8.2.1.2 The welding liners on face plate of main engine foundation are located and welded, or resin chock is bonded.

8.2.1.3 Main engine is to be assembled in accordance with the technical specification. Crank web deflection is to be measured.

8.2.2 Positioning of main engine

8.2.2.1 The main engine is to be positioned with reference to the shafting centerline.

8.2.2.2 The required thickness of adjustable liner is to be measured and machined to the required value. In general, the liner can be made of steel or cast iron. Epoxy-cast plastic liner may be used according to the specific procedures defined by the maker.

8.2.2.3 Bolt holes are to be machined and corresponding reamer bolts are to be prepared. Or tensile bolts are to be used.

8.2.2.4 The installation of main engine is to be carried out in accordance with specified procedures. The foundation bolts are to be fastened.

8.2.2.5 Key points of quality control:

- a) contact point of grind-fitting liner, clearance between contact surface after fastening and fitting of welded liner;

- b) accuracy of dimensions, surface roughness, circularity and cylindricity of reamer bolts;
- c) tightening moment or tensile force for fastening of the foundation bolts;
- d) crank web deflection of main engine;
- e) alignment accuracy, deflection and offset of flange of output end.

8.2.3 Installation of accessories

8.2.3.1 The fixing of lateral brazing and the installation of thrust block at output end of the main engine are to be carried out in accordance with the design drawings.

8.2.3.2 Key points of quality control:

- a) welding deformation;
- b) contact point, clearance and taper of grind-fitting liner.

8.3 Auxiliary machinery

8.3.1 Category of auxiliary machinery and basic requirements on installation

8.3.1.1 For the first class auxiliary machinery such as diesel generating set and steam turbine set etc., the alignment is to be done to the required standards. Before tightening the fastening bolts, the clearance between the contact surfaces is to be measured with feeler gauge.

8.3.1.2 For the second class auxiliary machinery such as fresh water pump etc., the fixing of the pump frame to the engine seating and the tightness of connection bolts during installation are to be checked.

8.3.1.3 For the third class auxiliary machinery such as filter and heat exchanger etc., the tightness of fastening bolt during installation is to be checked. For the complete packaged equipment, the installation quality may be checked in the workshop.

8.3.2 Installation of diesel generating set

8.3.2.1 The crank web deflection of the diesel engine is to be measured at cold condition and shall be in compliance with the recommended standard of the technical specification.

8.3.2.2 In case the diesel engine and generator are installed separately, their alignment is to be checked to confirm that they meet the required standard of the technical specification.

8.3.2.3 The crank case is to be kept clean from foreign matters.

8.3.3 Installation of steam turbine set

8.3.3.1 Generally, the centering rechecking of the steam turbine set is to be carried out after the launching of the ship.

8.3.3.2 If the steam turbine and the driven machine are installed separately, their shaft centers shall be precisely aligned.

8.3.3.3 Special tools are to be used in installing the steam turbine set. After the installation, the closeness of the liner, fixing of the fastening bolt, engagement of gears and fixing accuracy of piping connection are to be checked.

8.3.4 Key points of quality control;

- a) clearance between close contact liners;
- b) tightness of bolt connection;
- c) axial clearance;
- d) easy rotating by hand turning.

8.4 Boiler

8.4.1 Installation of boiler

8.4.1.1 Before installing the boiler, the integrity of the boiler and its accessories are to be checked against certificate of the classification society and snap test report.

8.4.1.2 After fastening, the foundation bolts are to be checked to ensure their robustness and reliability. The bolts are to be fitted with

locking devices.

8.4.1.3 The compensating connection pipe etc. used for the exhaust pipe are to meet the technical requirements of the bellow. Either rigid or elastic support is to be reasonably arranged.

8.4.2 Key points of quality control;

- a) clearance between liner and bolt;
- b) tension of support, bracing and pulling ring;
- c) pre tension of compensating connection pipe.

9 ELECTRIC INSTALLATION

9.1 Electric fittings

9.1.1 Electric fittings consist of cable supporters, cable penetrations and equipment supporters, etc. In general, standard fittings are to be used. The cable penetrations are to meet the watertight and fire-proof requirements for the places of application.

9.1.2 Key points of quality control;

- a) selection of cable penetrations;
- b) span of cable supporter;
- c) welding;
- d) painting.

9.2 Cable laying

9.2.1 Cables are to be laid at a distance away from heat source. Heat insulation measures are to be taken where necessary.

9.2.2 Cables for emergency switchboard are normally not to be laid through the engine room where they have no concern with.

9.2.3 Cables having no concern with explosion-proof rooms such as battery room, paint room, etc. are not to pass through

such spaces.

9.2.4 Cables for two sets of steering gears are to be laid separately as far apart as possible.

9.2.5 Cables of intrinsic-safe circuits are to be laid separately from other cables.

9.2.6 Cables laying aboard oil tanker are to be in compliance with the special requirements for oil tanker.

9.2.7 Cables are not to be laid closely embedded inside the insulation. Cables for refrigerated spaces are to be laid uncovered.

9.2.8 The material of cable fittings are to be selected according to the locations of their application.

9.2.9 Cable tray on supporting bracket may have 1 to 3 layers, and cables on the tray are to be fastened in bundles.

9.2.10 The total sectional area of cables in the cable duct is not to exceed 40% of the inner sectional area of the duct.

9.2.11 Void space is to be retained between the cables and between the cables and wall of cable trunk when the cables are laid through the cable trunk with fire-proof stuffing box. The total external sectional area of cables is not to exceed 30% of the inner sectional area of the trunk.

9.2.12 Cables passing through packing or cast nonorganic packing are to meet the watertight and fire-proof requirements for the places of their application and are to be provided with approval certificate issued by the classification society.

9.2.13 Key points of quality control:

- a) cable allocation;
- b) cable protection;
- c) cable penetration and sealing.

9.3 Installation and earthing of electric equipment

9.3.1 The enclosure protection grade for the electric equipment is to meet the requirements for the places of their installation. For equipment installed in dangerous zones and spaces, the explosion protection type of the equipment is to meet the requirements for that location.

9.3.2 In general neither pipe flange nor valve piece is to be arranged above the electric equipment.

9.3.3 Electric equipment is to be installed even and upright at proper height for convenient operation and maintenance.

9.3.4 All electric equipment are to be earthed with special earthing conductors or through the base of the equipment installation. Effective contacts to be ensured. The sectional area of the earthing conductor is to meet the relevant requirements of the classification society.

9.3.5 Key points of quality control:

- a) installation location and degree of protection;
- b) installation accuracy;
- c) equipment earthing.

9.4 Connection and earthing of metal coverings of cables

9.4.1 The enclosure protective property of the equipment is not to be impaired when the cable is laid into the electric equipment.

9.4.2 Clear and durable marks are to be provided according to the design drawings at the core ends in connecting the cables.

9.4.3 Special tools are to be used for cold-pressing and connecting of wire terminals. Wire connection are to be tidy and protected against loosening.

9.4.4 In case the cables of both the intrinsic-safe and non-

intrinsic-safe circuits are connected into one equipment, their cores are to be kept apart.

9.4.5 Metal sheath of the cable are to be effectively earthed at both ends. In safe region, cable of final branch circuit may be earthed at the source end only.

9.4.6 Cables of the intrinsic-safe system end of the signal and instrumentation system may be grounded at one end according to the requirements of their technical specification.

9.4.7 Key points of quality control:

- a) treatment of cable connecting terminal;
- b) grounding of cable metal covering;
- c) correctness of cable lead-in and connection.

10 AUTOMATIC CONTROL AND REMOTE CONTROL, TELEMETRY EQUIPMENT AND THEIR TESTING

10.1 Sensors

10.1.1 Temperature sensors may be tested by means of either heating method or analogue method. Pressure sensors may be adjusted and tested while the system is in operation or tested with test pump. Fluid level sensors and signal transducers are to be tested by analogue method.

10.1.2 Key points of quality control:

- a) setting value;
- b) setting position mark;
- c) locking of adjusting screw.

10.2 Automatic control and remote control

10.2.1 Main engine

10.2.1.1 Automatic and remote control tests such as remote operation, emergency stop, control position change-over, shut-down, overriding, safe speed reducing etc. are to be carried out

according to the requirements of the relevant technical specifications.

10.2.1.2 Key points of quality control:

- a) test procedure;
- b) test record.

10.2.2 Main generator and switchboard

10.2.2.1 Automatic function test such as safe stop, heavy load paralleling, light load relief, and load sharing, etc. are to be carried out for the electric power station.

10.2.2.2 Key points of quality control:

- a) test procedure;
- b) setting value;
- c) automatic control procedure;
- d) test record.

10.2.3 Automatic pump exchanging test

10.2.3.1 Sequential starting on main source failure and automatic pump transferring on low pressure or working medium are to be tested.

10.2.3.2 Key points of quality control:

- a) test procedure;
- b) automatic control procedure.

10.3 Monitoring and alarming

10.3.1 The monitoring and alarming functions are to be grouped under different systems or types of monitoring parameters, and such groups are to be tested in turn. For the two-state signal sensor, an ohmmeter is to be used to monitor its working conditions so as to ensure the accuracy of the setting value.

10.3.2 Key points of quality control:

- a) test procedure;

- b) setting of sensor;
- c) correct alarming.

10.4 Test of unattended engine room

The unattended engine room test comprises the tests on automatic operation of heavy fuel oil separator, lubricating oil separator, fresh-water generator, effluent separating plant, electric power station and all other relevant automation systems for unattended engine room.

10.4.1 Tests to be performed

10.4.1.1 Main engine remote control test

10.4.1.2 Engine room fire alarm simulation test.

10.4.1.3 Checking for automatic power supply from emergency switchboard at the loss of power from main switchboard when the ship is not running.

10.4.1.4 Test for automatic starting up of stand-by generator at the loss of power from main switch board when the ship is at sea, and sequential starting of pumps when power supply is recovered.

10.4.1.5 System adjustment, elimination of defects and miss alarms when the ship is running at designed speed.

- #### 10.4.2 key points of quality control;
- a) test procedure;
 - b) regulating and marking;
 - c) test record.

11 MOORING TEST AND SEA TRIAL

The mooring test and sea trial are to be carried out in accordance with the mooring test program and sea trial program respectively approved by both the classification society and ship

owner.

11.1 Mooring test and sea trial for hull part

11.1.1 Key points of quality control for inclining test and lightness measurement;

- a) test environment and conditions;
- b) over-weight and under-weight;
- c) draft, initial heeling and trimming;
- d) moving weight and distance;
- e) readout accuracy.

11.1.2 Tests for the deck machinery system include the tests for anchoring equipment, mooring equipment, cargo handling equipment, accommodation ladder equipment and water tight hatchcovers.

Key points of quality control;

- a) working condition and function of the equipment;
- b) accuracy of testing data;
- c) operation reliability.

11.1.3 The trial on ship operational performance includes the measuring of speed of the ship and measuring of inertial stopping distance, turning circle and course stability of the prototype ship.

Key points of quality control;

- a) environment conditions such as wind direction, wind speed, sea states and water depth of the trial zone;
- b) ballast condition of the ship;
- c) propulsion engine output and revolution;
- d) rudder angle and ship's course;
- e) test and trial procedure and means of data logging.

11.2 Mooring test and sea trial for machinery part

11.2.1 Key points of quality control for the testing of diesel generating set

- a) functioning of safety and protection system;

- b) deviation of explosion pressure and exhaust temperature of each cylinder;
- c) sensitivity and stability of governor;
- d) crank web deflection.

11.2.2 The tests of main propulsion system, includes those of the safeguard system, monitoring and controlling system, engine starting and reversing, minimum steady speed, remote astern manoeuvring, emergency manoeuvring, operation of surge charger, and measuring of shaft vibration (for prototype ship only).

Key points of quality control:

- a) tightness of fastening;
- b) monitoring and protection system for clamping, interlocking and shutdown;
- c) remote control and reversing manoeuvring system;
- d) temperature and lubrication of intermediate bearing;
- e) temperature, lubrication and sealing of stern bearing;
- f) ventilation of engine room;
- g) explosion pressure of cylinder, exhaust temperature and output power of main engine;
- h) working parameters of various systems;
- i) crank web deflection.

11.2.3 Key points of quality control for function test of boiler system

- a) automatic monitoring and controlling system for boiler ignition, combustion and water level;
- b) opening and closing of safety valve;
- c) stability of accumulated pressure.

11.2.4 Key points of quality control for functional test of the fire alarming system, bilge system, ballast system and fuel oil system:

- a) functioning of equipment at each system;

- b) working parameters.

11.2.5 The tests of special systems for the oil tanker includes those of pumping system, stripping pumping, remote monitoring of cargo tank level, remote control of valve, inert gas system, tank washing system, portable hydraulic ventilator, oil water discharge monitoring system, etc.

- a) Key points of quality control;
- b) working correctness of automatic control, remote control and remote monitoring system;
- c) only water discharging;
- d) fire protection and explosion prevention.

11.3 Mooring test and sea trial for electric part

11.3.1 Key points of quality control for the testing of main switchboards and generator sets:

- a) regulation of voltage characteristics of the generator;
- b) regulation of load characteristics of the diesel engine;
- c) test procedure;
- d) setting of protection devices.

11.3.2 Key points of quality control for the testing of emergency switchboard and generator set:

- a) setting of protection devices;
- b) setting of automatic starting devices.

11.3.3 Key points of quality control for the testing of electric motor's and controllers:

- a) overload protection of electric motor;
- b) working conditions.

11.3.4 Key points of quality control for the testing of communication and navigation equipment:

- a) check of power supply;
- b) functioning of the equipment.

- 11.3.5 Key points of quality control for the testing of transformers and lighting equipment;
- a) insulation of circuit;
 - b) arrangement of lighting fixtures.

12 COMPLETION AND DELIVERY

12.1 Delivery of cabin equipment, spares and supplies

Following items are to be delivered: cabin facilities, fire-fighting equipment, life-saving appliances, radio communication and navigational aids, spares and other supplies.

12.2 Inspection of markings and operation instructions

Inspection is to be done in accordance with the relevant rules and conventions on the correct fixing and assignment of loading markings, deadweight markings, fire-fighting indications and safety indications. Inspection is also to be done to confirm that life-saving arrangement plans and operation instructions are displayed correctly at all required locations.

12.3 As-built drawings and ship delivery documents

12.3.1 As-built drawings and documents specified in the shipbuilding contract.

12.3.2 Records of important testings and inspections made during construction and trial.

12.4 Certificates to be handed over

12.4.1 Class certificates and statutory inspection certificates specified in the shipbuilding contract.

12.4.2 Equipment certificates, navigation certificates and corresponding quality certificates specified in the shipbuilding contract.

12.4.3 Ship delivery and acceptance document.

PART 2

PLANS FOR APPROVAL AND INSPECTIONS AND TESTS FOR ACCEPTANCE

1 PLANS FOR APPROVAL

1.1 General

1.1.1 The plans and documents listed in this standard are the major items that shall be submitted to the classification society and ship owner for review and approval, and are subject to proper adjustment as the case may require for ships of different types, designed for different navigation zones or areas and flying different flags.

1.1.2 The plans and documents may be submitted by stages and in batches.

1.1.3 For ensuring that the ship design and construction could be completed in time, the ship owner shall review and return the plans and documents duly approved according to the time schedule and requirements set forth in the shipbuilding contract.

1.2 Plans and documents to be submitted for review and approval

The plans and documents to be submitted for review and approval are divided into four categories according to their professions (see table 2-1-1 through table 2-1-4) as: a) General, hull construction and painting; b) Hull outfitting; c) Machinery installation; and d) Electric installation. In the following tables, the items marked with symbol "✓" are the items that are to be reviewed and approved, and that with the symbol "△" means the items for reference.

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
1	Rudder stock and rudder shaft	a) Material quality report b) Fabrication inspection	Before fabrication After fabrication	✓	✓	With certificate from classification society
2	Rudder pinion, filler and rudder bearing, etc.	a) Material quality report b) Fabrication inspection	Before fabrication After fabrication	✓	✓	With certificate from classification society
3	Rudder plate	a) Material quality report b) Integrity of internal structure c) Main dimensions and visual quality of seam d) Tightness test	Before fabrication Before sealing up After welding During testing	✓	✓	With certificate from classification society

Table 2-2-2 Inspections and tests for hull outfitting

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
1	Funnel marks and ship name marks	Check for size and installation accuracy	After completion	✓	✓	
2	Shipside marks	Check for size and installation accuracy	After completion	✓	✓	
3	Bottom plating	Installation correctness and integrity	After completion	✓	✓	
4	Tightness test for hull	As per tightness test plan	During testing	✓	✓	
5	Deadweight measurement and inclining test	Measuring of lightweight, center of gravity and deadweight	During testing	✓	✓	
6	Secondary dewatering and pumping	a) Dewatering b) Finish coating	After dewatering Before delivery (or launching)	✓	✓	

Table 2-2-1 (end)

Table 2-1-1 General, hull construction and painting

No.	Items	For classification society	For ship owner
1	Technical specifications (including hull, machinery and electric parts)	△	
2	General arrangement	△	✓
3	Lines plan and offset table	△	△
4	Hydraulic curves		△
5	Loading convention and stability calculation	✓	✓
6	Damage stability calculation	✓	✓
7	Freeboard calculation	✓	✓
8	Longitudinal calculation		△
9	Speed and power estimation		△
10	Propeller calculation	✓	
11	Capacity plan for tanks and holds	✓	△
12	Tank sounding table		△
13	Propeller plan		✓
14	Fire zone division plan	✓	△
15	Intending test report	✓	△
16	Lightship weight measurement report		✓
17	Arrangement plan of marks of load line, draft and outboard bow	✓	✓

Table 2-1-1 (end)

No.	Items	For classification society	For ship owner
18	Fire control plan	✓	✓
19	Longitudinal strength calculation	✓	
20	Midship section	✓	✓
21	Main structural plan	✓	✓
22	Sheer expansion	✓	✓
23	Longitudinal and transverse bulkhead	✓	✓
24	Bow structure	✓	✓
25	Stern structure	✓	✓
26	Cargo space structure	✓	△
27	Engine room structure	✓	✓
28	Superstructure	✓	✓
29	Stem plan	✓	✓
30	Stern frame plan	✓	✓
31	Crane base and foundation structure	✓	✓
32	Tightness test diagram of the ship	✓	✓
33	Mooring test program	✓	✓
34	Sea trial program	✓	✓
35	Painting and coating specifications		✓

Table 2-1-2 Hull outfitting

No.	Items	For classification society	For ship owner
1	Inventory of hull outfittings, stores and accessories		✓
2	Equipment number calculation	✓	
3	Arrangement of anchoring equipment	✓	
4	Outfitting and marks of anchor chains	✓	✓
5	Arrangement of mooring equipment	✓	✓
6	Arrangement of steering equipment	✓	✓
7	Arrangement of cargo gear	✓	✓
8	Arrangement of metal doors, windows and covers of the ship	✓	✓
9	Arrangement of hatchcovers	✓	✓
10	Arrangement of rails and ladders of the ship	✓	✓
11	Arrangement of natural ventilation	✓	✓
12	Arrangement of life-saving and fire fighting appliances on board the ship	✓	✓
13	Arrangement of safety marks		✓
14	Arrangement of cabins		✓

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Table 2-1-2 (end)

No.	Items	For classification society	For ship owner
15	Arrangement of deck coverings	✓	
16	Arrangement of insulator		✓
17	Arrangement of radar mast and fore mast		✓
18	Arrangement of magnetic compass	✓	✓
19	Arrangement of cathodic protection		✓
20	Bilge and ballast piping system	✓	✓
21	Fire-fighting piping system	✓	✓
22	Air sounding and inspection piping system (including pumping)	✓	✓
23	Dredge system diagram	✓	
24	Potable water system diagram	Δ	✓
25	Water supply system diagram	Δ	✓
26	Arrangement of steering gear room	✓	✓
27	Air conditioning system and schematic diagram	✓	Δ
28	Arrangement of air conditioning ducts	✓	✓
29	Arrangement of equipment in air conditioning room		✓

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Table 2-1-3 Machinery installation

No.	Item	For classification society	For ship owner
1	List of machinery equipment	△	△
2	Estimation (calculation) of machinery equipment	△	
3	Calculation of lateral vibration of shafting	✓	
4	Calculation of longitudinal vibration of shafting	✓	
5	Calculation of shafting alignment	✓	
6	Calculation of torsional vibration of shafting	✓	
7	Calculation of propeller and shaft connection	✓	
8	Engine room arrangement (including workshop, store and tunnel)	✓	✓
9	Calculation of deck load for oil tanker	✓	
10	Emergency fire pump room arrangement and piping system	✓	✓
11	Installation drawing of main engine and reduction gearbox	✓	✓
12	Arrangement of emergency generator room	✓	✓
13	Piping arrangement of emergency generator room	✓	✓
14	Hydraulic (pneumatic) system and arrangement of deck machinery	✓	✓

Table 2-1-3 (continued)

No.	Item	For classification society	For ship owner
15	Soot chest arrangement and construction	✓	✓
16	Shafting arrangement (including intermediate and thrust shafts)	✓	✓
17	Lift shaft and stern lube assembly	✓	✓
18	Shafting strength calculation	✓	
19	Layout of propeller shaft and intermediate shaft	✓	✓
20	Fuel oil system	✓	✓
21	Lubrication oil system	✓	✓
22	Stern tube lubrication oil system	✓	✓
23	Sea water cooling system	✓	✓
24	Fresh water cooling system	✓	✓
25	Compressed air piping system	✓	✓
26	Control air piping system	✓	✓
27	Engine room steam piping system	✓	✓
28	Feed water piping system	✓	✓
29	Condensate water piping system	✓	✓
30	Engine room water supply piping system	△	✓
31	Engine room bilge, ballast and fire extinguishing system	✓	✓
32	Engine room venting, sounding and filling piping system	✓	✓

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
2	Propeller shaft	a) Material quality report (including heat treatment and non-destructive examination) b) Check for dimensions after machining c) Check for mating of propeller with shaft	Before machining	✓	✓	With certificate from classification society
3	Intermediate shaft	a) Material quality report (including heat treatment and non-destructive examination) b) Check for dimensions after machining c) Check for mating of propeller with shaft d) Check for dimensions after machining e) Check for dimensions from lathe	Before machining Before taking off turn lathe After assembling	✓ ✓ ✓	✓ ✓ ✓	With certificate from classification society

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
	f) Installation of propeller		During installation	✓	✓	
	g) Centring of shafting and mounting of intermediate bearing		After completion	✓	✓	
	h) Material quality of injector bolt and mating dimensions of reamer bolt with bolt hole of shafting		After completion	✓	✓	With non-destructive examination report
	i) Installation and tightness test of stern shaft sealing device		After installation	✓	✓	With certificate from classification society

Table 2-2-3 (continued)

Table 2-1-3 (continued)

No.	Items	For classification: society	For ship owner
33	Engine room ventilation piping arrangement	✓	✓
34	Exhaust piping system	✓	✓
35	Steam piping for room heating and miscellaneous usage	✓	✓
36	Engine room fresh water generating system	✓	✓
37	Calculation of oil tank heating piping	✓	✓
38	CO ₂ fire extinguishing system and CO ₂ store room arrangement	✓	✓
39	Calculation and operation instruction of CO ₂ fire extinguishing system	✓	✓
40	Sewage treatment system		✓
41	Remote control device of quick closing valve (including parts)	✓	✓
42	Board side manning arrangement and structure	✓	✓
43	Provision refrigerator room arrangement		✓
44	Provision refrigerator system		✓
45	Cargo pump room arrangement	✓	✓
46	Cargo oil control room arrangement	✓	✓
47	Arrangement of deck team fire extinguishing system	✓	✓

Table 2-1-3 (enn)

No.	Items	For classification: society	For ship owner
48	Arrangement of hydraulic pump station for cargo oil and ballast control systems	✓	✓
49	Cargo oil tank ballast water piping system	✓	✓
50	Control system for cargo oil and ballast water	✓	✓
51	Inert gas venting pipeline for cargo tank	✓	✓
52	Large tank heating oil pipe	✓	✓
53	Deck steam and condensate pipeline	✓	✓
54	Draft oil level sounding and oil temperature measuring pipeline	✓	✓
55	Tank washing machine arrangement and tank washing pipeline	✓	✓
56	Hot gas pipeline	✓	✓
57	Deck team fire extinguishing system	✓	✓
58	Oil and water discharge monitoring pipeline	✓	✓
59	Operation manual for oil and water discharge monitoring pipeline	✓	✓
60	Operation manual for cargo oil tank washing operation	✓	✓
61	Operation manual for cargo oil tank stripping operation	✓	✓

Table 2-1-1 Electrical Installation

No.	Items	For classification society	For ship owner
1	List of main electric equipment	△	△
2	Calculation of alternating current short circuit current	✓	△
3	Electric load calculation	✓	✓
4	Calculation of capacities for storage batteries	✓	△
5	Electric power or energy system diagram	✓	✓
6	Electrical power secondary system diagram	✓	✓
7	Normal lighting system	✓	✓
8	Emergency lighting system	✓	✓
9	Navigation light and signal light system	✓	✓
10	Radio communication system	✓	✓
11	Interior communication system	✓	✓
12	Navigation aid system	✓	✓
13	Arrangement of fire alarm and general alarm system	✓	✓
14	Single line diagram at main switchboard	✓	✓
15	Single line diagram of emergency switchboard	✓	△
16	Electric equipment arrangement	✓	✓
17	Lighting equipment arrangement	✓	✓
18	Interior communication system arrangement	✓	✓
19	Navigation aid equipment arrangement	✓	✓

Table 2-1-4 (end)

No.	Items	For classification society	For ship owner
20	Wheelhouse arrangement	✓	✓
21	Chart room arrangement		✓
22	Radio room arrangement	△	✓
23	Antenna arrangement	△	✓
24	Main cable layout	✓	△
25	Engine room monitoring and alarm system	✓	✓
26	List of spare parts and fittings for electric installation (including spares)		✓
27	Dangerous zones division (for oil tanker and chemical tanker)	✓	△
28	Electric system diagram of wheelhouse control console (panel)	✓	✓
29	Electric system diagram of engine control room console	✓	✓
30	Engine control room arrangement	✓	✓
31	Storage battery charging-discharging diagram and out line plan	✓	✓
32	Room electric equipment arrangement	✓	✓
33	Voltage drop calculation	✓	△
34	Audio and visual signaling device arrangement	✓	✓

2 INSPECTIONS AND TESTS FOR ACCEPTANCE

2.1 General

2.1.1 The inspections and tests listed in this standard are those to be examined and surveyed by the classification society and the ship owner for acceptance, and are subject to proper adjustment as the case may require for ships of different types, designed for different navigation zones and areas and flying different flags.

2.1.2 Generally, the builder shall, according to the construction schedule, notify the supervisor of the ship owner and the surveyor of the classification society to attend the inspection and test in the following procedures:

- a) A "Test Notice" shall be forwarded to the supervisor and surveyor one day before the inspection and test. In special case, this "Test Notice" may be sent to the supervisor and surveyor at the commencing of work of the test day.
- b) The builder shall notify the supervisor and surveyor of any temporary postponement of the scheduled inspection and test as early as possible.
- c) The inspection and test for painting may be proceeded in different procedures.

2.1.3 The supervisor and surveyor shall sign their names to the "Test Notice" after surveyed the test together with their opinion of accepting or not accepting the result of survey so as to let the builder to proceed with the work accordingly.

2.2 Items of inspections and tests

The following inspections and tests are grouped under five parts according to the professions (see table 2-2-1 through table 2-2-5) as hull construction and painting, outfitting, machinery installation, electric installation and automatic and remote control. In the tables, the items marked with symbol "✓" are the tests to be done for acceptance.

No.	Items	Content	Stage	Surveyor/Supervisor	Remarks
1	110 steel plates and sections	Material quality report and visual appearance	Before processing	✓	With certificate from dealer/author society
2	140 fittings and long rigger, store frame, etc.	Material quality report and visual appearance	Before and after processing	✓	With certificate from classification society
3	Hull working material (under plate, etc.)	Material quality report and visual appearance	Before processing	✓	With certificate from classification society
4	Block assembly, Mo 1 hull	Structural integrity and visual quality of seam	After completion	✓	
	Superstructure	Structural integrity and visual quality of seam	After completion	✓	

Table 2-2-1 Inspections and tests for hull construction and painting

No.	Items	Content	Stage	Surveyor/Supervisor	Remarks
5	Stowage assembly, Mo 1 hull	a) Structural integrity and visual quality of seam b) Non-destructive inspection c) Structural integrity and visual quality of seam	After completion	✓	
6	Loading marks and draft marks	a) Check for size b) Check for installation c) Check for installation accuracy	After marking	✓	
7	Measuring of dimensions other than depth	Overall length, moulded breadth, moulded depth and deflection of keel	Before launching	✓	
	Superstructure	Structural integrity and visual quality of seam	After completion	✓	
	Mo 1 hull	Structural integrity and visual quality of seam	After completion	✓	
	Stowage assembly	Structural integrity and visual quality of seam	After completion	✓	
	Superstructure	Structural integrity and visual quality of seam	After completion	✓	
	Loading marks and draft marks	a) Check for size b) Check for installation c) Check for installation accuracy	After marking	✓	
	Measuring of dimensions other than depth	Overall length, moulded breadth, moulded depth and deflection of keel	Before launching	✓	

Table 2-2-1 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
1	Rudder stock and rudder shaft	a) Material quality report b) Fabrication inspection	Before fabrication After fabrication	✓	✓	With certificate from classification society
2	Rudder pinion, filler and rudder bearing, etc.	a) Material quality report b) Fabrication inspection	Before fabrication After fabrication	✓	✓	With certificate from classification society
3	Rudder plate	a) Material quality report b) Integrity of internal structure c) Main dimensions and visual quality of seam d) Tightness test	Before fabrication Before sealing up After welding During testing	✓	✓	With certificate from classification society

Table 2-2-2 Inspections and tests for hull outfitting

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
1	Funnel marks and ship name marks	Check for size and installation accuracy	After completion	✓	✓	
2	Shipside marks	Check for size and installation accuracy	After completion	✓	✓	
3	Bottom plating	Installation correctness and integrity	After completion	✓	✓	
4	Tightness test for hull	As per tightness test plan	During testing	✓	✓	
5	Deadweight measurement and inclining test	Measuring of lightweight, center of gravity and deadweight	During testing	✓	✓	
6	Secondary dewatering and pumping	a) Dewatering b) Finish coating	After dewatering Before delivery (or launching)	✓	✓	

Table 2-2-1 (end)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
4	Rudder system	a) System integrity b) Performance test c) Automatic and manual steering function test	After completion During mooring test and sea trial	✓	✓	
7	Autonomous and accessories	a) Material quality report of rudders, chains, shackles and swivels b) Visual quality c) Stamp marks	Before installation Return installation	✓	✓	With product certificate from classification society
8	Welds	Installation correctness	After installation	✓	✓	With product certificate from classification society

Table 2-2-2 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
4	Installation of rudder equipment	a) Assembly of rudder bearing b) Installation of rudder pintle c) Assembly of rudder stock, pintle and pintle Alignment d) Installation clearance of rudder bearing e) Check for rudder plate zero position f) Check for gap of rudder post stopper	After assembly After installation During assembly After installation After installation Before launching	✓	✓	
5	Electrical gear	Installation correctness	After completion	✓	✓	With certificate from classification society

Table 2-2-2 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
13	Life-saving appliance	a) Lifeboat, boat with davit and cable b) Load test of davit c) Lifeboat hooking and dehooking test d) Lifeboat dewatering test e) Check for boat scores and accessories f) Check for correct removal and storage of other life-saving appliances and fittings	Before installation Mooring test Mooring test Mooring test After installation	✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓	With product certificate from classification society With product certificate from classification society

Table 2-2-2 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
9	Chain stopper, quick releasing device	Installation correctness	After installation	✓	✓	
10	Anchor system	a) Running test b) Dropping and lifting test	Running mooring test and sea trial Running mooring test and sea trial	✓ ✓	✓ ✓	
11	Mixing equipment	Installation correctness and integrity	After completion		✓	
12	Cable winch	a) Installation integrity b) Running test	After installation Mooring test		✓ ✓	With product certificate from classification society

Table 2-2-2 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
17	Derrick boom	a) Material quality report b) Welding seam quality c) Strength of parts and components	Before fabrication After completion After completion	✓ ✓ ✓	✓ ✓ ✓	With certificates from classification society
18	Crane gear	d) Check for system integrity e) Check winch running test f) Function test	After completion After completion During mooring test	✓ ✓ ✓	✓ ✓ ✓	With product certificate from classification society

Table 2-2-2 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
19	Accommodation order and weight	a) Load test b) Function test	After installation After completion	✓ ✓	✓ ✓	With product certificate from classification society
20	Crane and derrick post	c) Material quality report d) Structure integrity e) Visual quality of seam f) Non-destructive inspection of seams	Before fabrication After completion After completion After completion	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	With certificates from classification society
21	Crane boom	a) Load test b) Function test	After installation After completion	✓ ✓	✓ ✓	With product certificate from classification society

Table 2-2-2 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
22	Container fasteners	Installed on correct cross	After completion	✓	✓	With product certificate from classification society
23	Container self	a) Material quality report b) Installation integrity and working quality c) Function test	Before fabrication After completion	✓	✓	With product certificate from classification society
24	Fire fighting equipment	Integrity and correctness	After installation	✓	✓	With product certificate from classification society

Table 2-2-2 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
15	Cargo	Operator and load test	During mooring test	✓	✓	With product certificate from classification society
26	Cargo hold hatch covers	a) Material quality report b) Installation integrity and working quality c) Tightness test d) Function test	Before fabrication After completion	✓	✓	With product certificate from classification society
27	Water-tight covers, partitions and weather-tight closing devices (including door)	a) Installation integrity b) Tightness test	After completion	✓	✓	With product certificate from classification society

Table 2-2-2 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
26	Scoring	a) Cleaning and dust on lining	Before boring	✓	✓	Check for condition of under sluit at same time
		b) Boring	After boring	✓	✓	
		c) Installation and tightness test of lubrication of pipe of steam tube	After installation	✓	✓	
		d) Freezing of steam tube fore and aft bearing	During pressing	✓	✓	
		e) Measuring of clearance between propeller shaft and bearing	After assembling	✓	✓	

Table 2-2-3 Inspections and tests for machinery installation

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
23	Fire-proof materials for cables	Fire proof material and fire-proof structure integrity	Before and after completion	✓	✓	With product certificate from classification society
26	Cable ties	a) Integrity and visual quality b) Running test for accuracy machine and gully equipment	After completion	✓	✓	
27	Life	a) Load test and running test b) Safety performance test	After completion	✓	✓	With product certificate from classification society

Table 2-2-2 (end)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
2	Propeller shaft	a) Material quality report (including heat treatment and non-destructive examination) b) Check for dimensions after machining c) Check for mating of propeller with shaft	Before machining	✓	✓	With certificate from classification society
3	Intermediate shaft	a) Material quality report (including heat treatment and non-destructive examination) b) Check for dimensions after machining c) Check for mating of propeller with shaft d) Check for dimensions after machining e) Check for dimensions from lathe	Before machining Before taking off turn lathe After assembling	✓ ✓ ✓	✓ ✓ ✓	With certificate from classification society

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
	f) Installation of propeller		During installation	✓	✓	
	g) Centring of shafting and mounting of intermediate bearing		After completion	✓	✓	
	h) Material quality of injector bolt and mating dimensions of reamer bolt with bolt hole of shafting		After completion	✓	✓	With non-destructive examination report
	i) Installation and tightness test of stern shaft sealing device		After installation	✓	✓	With certificate from classification society

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
7	Running test of main engine	a) Test of main engine alarm and safety devices and sea trial b) Check for working condition of pump and piping attached to main engine c) Operation test of main engine c) Running test of main engine e) Measuring of crank web deflection f) Piston lifting for inspection and measuring	During mooring test and sea trial During mooring test and sea trial During mooring test and sea trial During mooring test and sea trial After main engine test After main engine test	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
1	Stem tubes	a) Material quality report b) Tightness test after welding	Before machining	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	With certificate from classification society
2	Stem tubes bearing	c) Material quality report b) Check for dimensions after machining	Before machining	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	With certificate from classification society
3	Position fixing and installation of main engine	a) Positioning of main engine b) Grid-tilting of lower engine c) Tightness of mating-down bolt d) Measuring of crank web deflection	After pre-boring After machining During installation Before engine starting	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	With product certificate from classification society

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
1.	Air reservoir	a) Completeness of accessories and tightness test b) Inspection of safety valve	After completion	✓	✓	With product certificate from classification society
12	Auxiliary boiler and exhaust gas economizer	a) Tightness test of system b) Running test c) Test of safety valve (including accumulation test)	During running test	✓	✓	With product certificate from classification society
			During mooring test and sea trial	✓	✓	

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
8	Diesel generating set	a) Completeness of installation b) Measuring of crank web deflection c) Running test d) Partial running test	After completion	✓	✓	With certificate from classification society
9	Emergency generating set	a) Completeness of installation b) Function test	After installation	✓	✓	With certificate from classification society
10	Air compressor	a) Test of safety valve and safety device b) Function test (including air charging test)	During mooring test	✓	✓	With product certificate from classification society
			During mooring test and sea trial	✓	✓	

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
17	Sewage treat- ment plant	Effectiveness test	During mooring test	✓	✓	With product certificate from classification society
18	Trash water separator	Effectiveness test	During sea trial		✓	
19	Engine room lifting crane	Safety device test and loading capacity test	During mooring test	✓	✓	With product certificate from classification society
20	Workshop equipment	Operation test	During mooring test		✓	
21	Pressure vessel	Effectiveness test	During mooring test		✓	With product certificate from classification society

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
12	Helicopter	Function test	During mooring test	✓	✓	With product certificate from classification society
14	Lucine pumps (pumps for main engine, auxiliary machinery, boiler and shafting, etc.)	Effectiveness test	During mooring test		✓	With product certificate from classification society
15	Oil separator	Effectiveness test	During mooring test		✓	With product certificate from classification society
16	Waste oily water separator	Effectiveness test	During mooring test	✓	✓	With product certificate from classification society

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
26	Compressed air and control oil pipeline	a) Hydraulic test b) Tightness test c) Test of safety valve and receding valve d) Effectiveness test	Before fixing After fixing During mooring test	✓ ✓ ✓	✓ ✓ ✓	
27	Fuel oil pipeline	a) Hydraulic test b) Tightness test c) Effectiveness test	Before fixing After fixing During mooring test	✓ ✓ ✓	✓ ✓ ✓	
28	Lubrication oil pipeline	a) Hydraulic test b) Tightness test c) Pushing with oil d) Effectiveness test	Before fixing After fixing After fixing During mooring test	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
22	Engine room ventilator	a) Effectiveness test b) Remote control test	During mooring test During mooring test	✓ ✓	✓ ✓	With product certificate from classification society
23	Room ventilator	Effectiveness test	During mooring test	✓	✓	With product certificate from classification society
24	Lateral thruster	Effectiveness test	During mooring test and sea trial	✓	✓	With product certificate from classification society
25	Board side valve	Correctness of mounting	After mounting	✓	✓	With product certificate from classification society

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
32	Water supply pipe for whole ship (including engine room)	a) Tightness test b) Smooth flowing test	After fixing During mooring test		✓ ✓	
33	Deck scupper and sanitary discharge pipeline	Free flowing test	During mooring test		✓	
34	Water fire extinguishing pipeline	a) Hydraulic test b) Tightness test c) Effectiveness test	Before fixing After fixing After fixing	✓ ✓ ✓	✓ ✓ ✓	

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
29	Sea water and fresh water cooling pipelines	a) Tightness test b) Effectiveness test	After fixing During mooring test	✓	✓	
30	Boiler feed water, steam and condensate pipelines	a) Hydraulic test b) Tightness test c) Effectiveness test	Before fixing After fixing During mooring test	✓ ✓ ✓	✓ ✓ ✓	
31	Steam heating pipeline	a) Hydraulic test b) Tightness test c) Smooth steam flowing test	Before fixing After fixing During mooring test	✓ ✓ ✓	✓ ✓ ✓	

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
38	Ballast water pipeline	a) Tightness test b) Effectiveness test for emergency action	After fixing During mooring test	✓ ✓	✓ ✓	
39	Helicoptering pipeline	a) Air tightness test b) Vacuum test c) Test of refrigeration and temperature keeping	After fixing During mooring test	✓ ✓	✓ ✓	
40	Air conditioning pipeline	Effectiveness test	During mooring test	✓	✓	

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
33	CO ₂ line extinguishing system	a) Hydraulic test b) Tightness test c) Alarm function test d) Effectiveness test (simulated) test	Before fixing After fixing During mooring test	✓ ✓ ✓	✓ ✓ ✓	
34	Emergency fire alarm test	Effectiveness test	During mooring test	✓	✓	
37	Ballast water pipeline	a) Tightness test b) Effectiveness test	After fixing During mooring test	✓ ✓	✓ ✓	

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
41	Cargo oil pump	Running test	During mooring test or sea trial	✓	✓	With product certificate from classification society
42	Special ballast pump	Running and effectiveness test	During mooring test and sea trial	✓	✓	With product certificate from classification society
43	Shifting pump	a) Running and effectiveness test b) Effectiveness test at remote control system	During mooring test	✓	✓	With product certificate from classification society

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
41	Air horn	Effectiveness test	During mooring test	✓	✓	With product certificate from classification society
42	Air sounding and filling pipelines	Free flowing test	During mooring test	✓	✓	
43	Hydraulic system	a) Hydraulic test b) Tightness test c) Flushing with oil d) Effectiveness test of power pump station	Before fixing After fixing Before mooring test During mooring test	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	

Table 2-2-3 (continued)

No.	Items	Content	Stages	Surveyor	Supervisor	Remarks
50	inert gas explosion and pilot system and pipeline	a) Tightness test b) Running test c) Test of alarm and safety devices d) Function (simulation) test of system and measuring of CO ₂ content	After fixing During making test During rooming test	✓ ✓ ✓	✓ ✓ ✓	With product certificate from classification society
51	Liquid level remote gauging and drill measuring system	Efficiency test	During mooring test or sea trial	✓ ✓	✓ ✓	With product certificate from classification society

Table 2-2-3 (continued)

No.	Items	Content	Stages	Surveyor	Supervisor	Remarks
47	Container and air elevator cargo pump	a) Efficiency test with steam turbine driver cargo pump b) Vacuum system test	During mooring test or sea trial	✓ ✓	✓ ✓	With product certificate from classification society
48	Valve remote control system of cargo tank	a) Tightness test b) Remote control test	After fixing During mooring test	✓ ✓	✓ ✓	With product certificate from classification society
49	Cargo oil system and segregated ballast piping	c) Tightness test b) Simulation test	After fixing During mooring test or sea trial	✓ ✓ ✓	✓ ✓ ✓	

Table 2-2-3 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
33	Oil/water interface detector	Function test	During mooring test	✓	✓	With product certificate from classification society
34	(Largo oil steam heating system)	a) Tightness test b) Smooth steam flowing test	After fixing During mooring test	✓	✓	
35	Block room unit	Function test (simulated)	During mooring test	✓	✓	With product certificate from classification society

Table 2-2-3 (end)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
32	Crane oil tank washing machine and tank washing system	a) System tightness test b) Function test of sea water tank washing	After fixing During sea trial	✓	✓	With product certificate from classification society
33	Water tank washing sea water	Function test	During sea trial	✓	✓	With product certificate from classification society
34	Oil bridge diverging monitoring system	Function test (simulated)	During sea trial	✓	✓	With product certificate from classification society

Table 2-2-3 (continued)

No.	Items	Content	Stages	Supervisor	Supervisor	Remarks
4	Universal generating set	a) Alarm device test b) Measuring of insulation resistance c) Loading characteristics test d) Parallel operation test e) Automatic operation test	During morning test During morning test During morning test During morning test During morning test	✓	✓	With product certificates from classification society
5	Emergency generating set	a) Alarm device test b) Measuring of insulation resistance c) Loading characteristics test d) Parallel operation test e) Automatic operation test f) Automatic power supply test	During morning test During morning test During morning test During morning test During morning test During morning test	✓	✓	With product certificates from classification society

Table 2-2-1 (continued)

No.	Items	Content	Stages	Supervisor	Supervisor	Remarks
1	Cable laying	Correctness of cable laying in various zones	After laying	✓	✓	With product certificate from classification society
2	Cable penetrations on fire-proof/water-tight bulkheads and/or decks	Check to construction of cable penetrations	After mounting	✓	✓	With product certificate from classification society
3	Main switchboard and emergency and emergency switchboard	a) Correctness of installation b) Measuring of insulation resistance c) Testing of protective device e) Function test	During morning test During morning test During morning test During morning test	✓	✓	With product certificate from classification society

Table 2-2-1 Inspections and tests for electric installation

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
11	Emergency lighting	a) Measuring of insulation resistance b) Effectiveness test	During morning test	✓	✓	
12	Alarm system (including fire alarm, CO release alarm, general alarm bell, door lock, in alarm, etc.)	Effectiveness test or simulation test	During morning test	✓	✓	
13	Navigation lights, signaling lights	c) Effectiveness test d) Alarm test	During morning test	✓	✓	With product certificate from classification society
14	Electric galley appliances	Further test	During morning test		✓	
15	Electric main engine order telegraph	Effectiveness test	During morning test	✓	✓	With product certificate from classification society

Table 2-2-4 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
6	Snail generator	Load test or effectiveness test	During morning test and sea trial	✓	✓	With product certificate from classification society
7	Charging, discharging, storage battery, electric motors and their controllers for auxiliary machines	a) Measuring of insulation resistance b) Effectiveness test	During morning test	✓	✓	With product certificate from classification society
8	Emergency cut out oil supply for engine	Effectiveness test	During morning test	✓	✓	With product certificate from classification society for those above 300 kW
9	Normal lighting	a) Measuring of insulation resistance b) Effectiveness test	During morning test	✓	✓	

Table 2-2-4 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
21	Satellite navigation receiver	Effectiveness test	During sea trial	✓	✓	With product certificate from classification society
22	Radio weather facsimile	Effectiveness test	During sea trial	✓	✓	With product certificate from classification society
23	Radio console and antenna system	a) Check for quality of antenna mounting and location of antenna b) Effectiveness test	During mooring test During sea trial	✓	✓	With product certificate from classification society

Table 2-2-4 (continued)

No.	Items	Content	Stage	Surveyor	Supervisor	Remarks
15	Signaling systems such as fogging system, sound powered telephone system, automatic telephone system, fog whistle, etc.	Effectiveness test	During mooring test and sea trial	✓	✓	With product certificate from classification society
16	Echo sounder	Effectiveness test	During mooring test and sea trial	✓	✓	With product certificate from classification society
18	Speed log	Effectiveness test	During mooring test and sea trial	✓	✓	With product certificate from classification society
19	Gyro compass	a) Effectiveness test b) Error correction	During sea trial and mooring test During sea trial	✓	✓	With product certificate from classification society

Table 2-2-4 (continued)

No.	Items	Content	Stages	Surveyor	Supervisor	Remarks
1	Main engine remote control test	Effectiveness test	During mooring test and sea trial	✓	✓	
2	Automatic monitoring and alarm devices	Effectiveness test	During mooring test	✓	✓	
3	Automatic operation of unattended machinery space	Effectiveness test	During sea trial	✓	✓	

Table 2-2-5 Inspections and tests for automatic control and remote control

No.	Items	Content	Stages	Surveyor	Supervisor	Remarks
24	Radar transponder	Effectiveness test	During mooring test and sea trial	✓	✓	
25	Two-way radio telephone	Effectiveness test	During mooring test	✓	✓	With product certificate from classification society
26	Navigator or alarm receiver	Effectiveness test	During mooring test and sea trial	✓	✓	With product certificate from classification society
27	Broadcasting station	Effectiveness test	During mooring test	✓	✓	
28	Antenna duplexer	Effectiveness test	During mooring test and sea trial	✓	✓	

Table 2-2-4 (end)

1 HULL CONSTRUCTION

1-1.1 Surface defects of steel plates are to be kept within the limits as defined in table 3-1-1.

Items	Requirements
Pits, taking, scores, scratches and dirt on plates	<p>(1) Zone A is in excellent order, with very slight surface defects less than 0.1mm and no reporting is needed</p> <p>(2) Zone B is in good order, with a certain amount of permissible surface defects, and no reporting is needed. Area enclosed by full lines denotes plate with thickness less than 20mm and area enclosed by dotted lines (including slight irregularities) plates with thickness from 20 to 30mm</p> <p>(3) Zone C is in disorder, and reworking is needed. A certain amount of impermissible surface defects that shall be repaired according to the requirement</p>

Items	Requirements
Plts.	(1) Zone A is in excellent order, with very slight surface defects less than 0.1mm and no reporting is needed
taking,	(2) Zone B is in good order, with a certain amount of permissible surface defects, and no reporting is needed. Area enclosed by full lines denotes plate with thickness less than 20.1mm and area enclosed by dotted lines (including slight irregularities) plates with thickness from 20 to 30mm
scatches	(3) Zone C is in disorder, and reworking is needed. i.e. there are certain amount of impermissible surface defects that shall be reported according to the requirement
and dirt	
or holes	

The diagram shows a rectangular plate divided into three horizontal zones labeled A, B, and C. Zone A is the top section, Zone B is the middle section, and Zone C is the bottom section. To the right of the plate is a vertical scale labeled 'Defect rate, %' with values 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1.0. Horizontal lines connect the zones to the scale: Zone A is between 0.1 and 0.2, Zone B is between 0.2 and 0.3, and Zone C is between 0.3 and 0.4. A dashed line is drawn across the plate at the 0.4 level. A label 'Defect rate, %' is also present at the bottom right of the diagram.

Items	Requirements
(4) Repairing method for surface defects:	<p>For $d < 0.07\lambda$, by grinding (but in no case $d \leq 0.1\text{mm}$)</p> <p>For $0.07\lambda \leq d \leq 0.2\lambda$, by built-up welding and followed by grinding</p> <p>where d is depth of defect, mm; λ is plate thickness, mm</p> <p>In case the defect depth exceeds 20% plate thickness and defect area exceeds 2% plate area, the part of plate is to be replaced as required</p>

Item	Requirement
Negative thickness tolerance for sheet piles of full structure	0.3 as max.

1.1.3 Lamination of steel plates to be treated according to table 3-1-3.

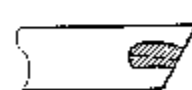

Items	Requirements
<div data-bbox="925 1366 1117 1612">  <p>(a)</p>  <p>(b)</p> </div>	<p>(1) In case the range of lamination is fairly small it can be clipped out and built-up by welding as shown in fig. 10. In case the range of lamination is fairly small and not near the plate surface it is preferable to do the built-up welding as shown in fig. 10.</p> <p>(2) In case the lamination is severe and corrective work must be carried out repaired and replaced by appropriate method.</p> <p>(3) In case the built-up welding length exceeds 25%, the edge length of the steel plate must be checked. Inspection is to be done to check the quality.</p>

Table 3-1-3

Items	Requirements
Severe lamination	<p>(1) It is recommended to change part of the plate in case the lamination is fairly extensive.</p> <p>(2) Minimum breadth or length of the part of shipboard steel plate to be replaced are:</p> <p>For shell plate or strength deck plate:</p> <p>Within 0.6 L, amidship, 1.50mm</p> <p>Outside 0.6 L, amidship, 350mm</p> <p>For other structures: 300mm or 10 times plate thickness, whichever is greater.</p> <p>If individual cases, the above values may be reduced to 50mm ± 4% when the plate thickness is 10mm.</p> <p>(3) The whole plate must be replaced in case the lamination is extremely severe and extensive.</p>

Table 3-1-3 (end)

1.1.4 Defects of coating steel surface are to be treated according to table 3-1-4.

Table 3-1-4

Items	Remarks
In case the depth of defects is over 20% plate thickness or the defect is over 25mm in depth and 150mm in length	
Hacking and building up by appropriate method or non-destructive inspection	
Air bubbles, flaws and other hazardous defects	

1.2 Marking

1.2.1 Position deviation of the marking is to be kept within the limits as defined in table 3-1-5.

Table 3-1-5

Items	Standard range	Allowable limits	Remarks
Center line, theoretical line, alignment line, check line and installation position line	2.0	3.0	

mm

1.2.2 Deviation of marking dimensions of parts and members shall be kept within the limits as defined in table 3-1-6.

Table 3-1-6

Items	Standard range	Allowable limits	Remarks
Length	12.0	3.0	
Breadth	+1.5	±2.5	
Difference between diagonals	±2.0	±3.0	For rectangular plate
Curved configuration	±1.0	±2.5	
Straightness	$L \leq 4m$	≤1.0	For straight edges of part or member
	$4m < L \leq 8m$	≤1.2	
	$L > 8m$	≤2.0	
Angle	±1.5	±2.0	For every member
Out-of-squareness	≤1.5	≤2.0	

mm

1.2.3 Deviation of working dimension of block structure is to be kept within the limits as defined in table 3-1-7.

Items	Standard range	Allowable limits	Remarks
Deviation of working line of panel back, compared with designed dimensions	±0.5	3.0	
Deviation of working line of member on back, compared with designed position	±2.5	±3.5	

1.3 Cutting

1.3.1 Gas cutting

1.3.1.1 Surface roughness of gas cutting is to be kept within the limits as defined in table 3-1-8.

Items	Standard range	Allowable limits	Remarks
Free edges of members			
Important members	0.10	0.20	(1) For steel sections, tolerance of mechanical cutting is the same as those for manual cutting.
Others	0.10	0.30	(2) Gaps on free edges shall be removed.
Free edges of members			
Important members	0.10	0.20	
Others	0.10	0.30	

Table 3-1-8 (cont)

Items	Standard range	Allowable limits	Remarks
Vertical grooves			
Important members	0.10	0.20	
Others	0.10	0.30	
Free edges of members			
Important members	0.10	0.20	
Others	0.10	0.30	

1.3.1.2 Notches of gas cutting are to be kept within the limits as defined in table 3-1-9.

Items	Standard range	Allowable limits	Remarks
Free edges of members			
Important members	0.10	0.20	(1) For steel sections, tolerance of mechanical cutting is the same as those for manual cutting.
Others	0.10	0.30	(2) Gaps on free edges shall be removed.
Free edges of members			
Important members	0.10	0.20	
Others	0.10	0.30	

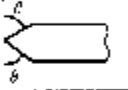
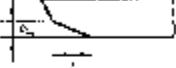
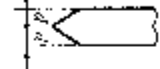
Size of member	Dimension of groove			Items	Standard range	Allowable limits	Remarks
	Angle of groove, θ	Length of groove, l	Depth of groove, d				
Primary members				±2°	±0.5d	±2.0	For example, for members with high accuracy demand such as floors and girders, etc., in double bottom
Secondary members				±3.3		±5.0	
				±2.0		±1.0	
Breadth of face for						±1.0	
						±0.5	

Table 3-1-10 (end)

mm

Straightness of plate edge	Items		Remarks
	Automatic welding seam	Semi-automatic and manual welding seam	
	≤0.4	≤1.5	
	Allowable limits	≤0.5	

Table 3-1-10

mm

1.3.1.3 Deviation of gas cutting dimension is to be kept within the limits as defined in table 3-1-10.

Weld edge	Items		Standard range	Allowable limits	Remarks
	Butt weld	Filler weld			
	Sheet pile and strong deck within area of 0.67 m ² and above	Others		<2.0	Match is to be repaired by grinding or butt-welding. L is ship length
				<3.0	
				<3.0	

Table 3-1-9 (end)

mm


Items	Standard range		Allowable limits	Remarks	
	Primary members	Secondary members			
Breadth of flange, b	≤ 3.0	≤ 5.0	≤ 5.0		
Depth of web, d	≤ 2.0	≤ 3.0	≤ 3.0		
Angle of flange, θ	≤ 2.5	≤ 4.5	≤ 4.5		
Straightness in the plane of flange	≤ 1.0	≤ 2.5	≤ 2.5		
Straightness in the plane of web	≤ 1.0	≤ 2.5	≤ 2.5		

Table 3-1-13

mm

1.4 Forming

1.4.1 Deviation of flanges is to be kept within the limits as defined in table 3-1-13.

Items	Standard range		Remarks
	Standard range	Allowable limits	
Straightness of the edge	≤ 0.5	≤ 1.0	Per 10 m in length
Angle of groove	$\leq 2^\circ$	$\leq 3^\circ$	

Table 3-1-12

mm

1.3.3 Deviation of planed and milled edges is to be kept within the limits as defined in table 3-1-12.

Items	Standard range		Remarks
	Standard range	Allowable limits	
Length of member	≤ 3.0	≤ 4.0	
Breadth of member	≤ 2.0	≤ 3.0	
Breadth of face bar height of 'cor'	≤ 2.0	≤ 3.0	
Straightness of the edge	≤ 1.0	≤ 1.5	
Curved edge	≤ 1.5	≤ 2.0	

Table 3-1-11

mm

1.3.2 Deviation of shearing dimension is to be kept within the limits as defined in table 3-1-11.

Items		Standard range		Allowable limits	Remarks
Angles, α	Angle bending	± 1.5		2.0	4 per 100
	Local bending	11.0		+1.5	per 1 m in length, connected with template
Built-up profiles		2.0		± 4.0	per 10 m in length, connected with template
		± 1.5		1.5.0	6 per 100

Table 3-1-16

1.4.4 Bending deviation of angles and built up profiles is to be kept within the limits as defined in table 3-1-16.

Items		Standard range		Allowable limits	Remarks
Depth of corrugation, h	Pitch of corrugation, d	Connected		± 2.0	± 3.0
		Not connected		± 6.0	1.9.0

Table 3-1-15

1.4.3 Deviation of corrugated plate is to be kept within the limits as defined in table 3-1-15.

Items		Standard range		Allowable limits	Remarks
Depth of channel, h	Breadth of channel, b	± 3.0		± 6.0	
		± 3.0		± 6.0	

Table 3-1-14

1.4.2 Deviation of channelled plate is to be kept within the limits as defined in table 3-1-14.

1.4.5 Bending deviation of shell plates is to be kept within the limits as defined in table 3-1-17.

Items	Plate with single curvature		Plate with double curvature		Remarks
	Gap between curved plate and template	Straightness of check line on irregular template	Deviation between drawn line and reference line on template	Gap between plate and box template in breadthwise direction Gap between plate and box template in lengthwise direction	
Standard range	≤2.5	≤2.5	±2.0	≤2.0	Within each frame spacing
	≤5.0	≤5.0	±3.0	≤3.0	
Allowable limits					Within each frame spacing

Table 3-1-17

mm

1.4.6 Heating is to be proceeded according to the requirements as defined in table 3-1-18.

Table 3-1-18

Items	Maximum heating temperature on surface				Remarks
	High tensile steel σ _s ≥0.38%	AH-DH steel σ _s ≥0.38%	High tensile steel σ _s ≥0.38%	EH steel σ _s ≥0.38%	
Standard range	Water or air cooling immediately after heating	Water or oil cooling immediately after heating	Water or oil cooling immediately after heating	Water or oil cooling immediately after heating	Calculation equation for carbon equivalency: $C_{eq} = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni}{15}$
	Air cooling and subsequently water cooling after heating	Water cooling under 930°C, water cooling started when temperature below 900°C	Air cooling under 930°C, water cooling started when temperature below 900°C	Air cooling under 930°C, water cooling started when temperature below 900°C	
Allowable limits	Water or air cooling immediately after heating	Air cooling after heating	Air cooling after heating	Air cooling after heating	

mm

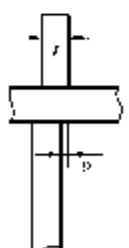
1.5 Fixing and assembling

1.5.1 Fixing and assembling of various welding joints

1.5.1.1 Position deviation of fillet welding joints is to be kept within the limits as defined in table 3-1-19.

Table 3-1-19

mm

Items	Standard range	Allowable limits	Remarks
 <p>a's misalignment t is thickness of thinner plate</p>	$\leq t/3$	$\leq t/8$	(1) When $t/3 < a \leq t/2$, leg length is to be increased as shown in the figure
			(2) When $a > t/2$, joint should be refixed
			Division exceeding of allowable values is to be modified according to
primary structure (longitudinal stressed members)			
Other stressed members			

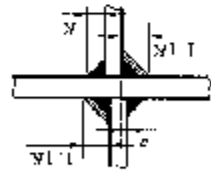
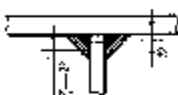
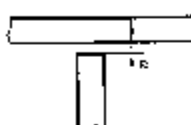
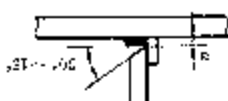




Table 3-1-19 (continued)

mm

Remarks	Allowable limits	Gap before fillet welding		Items
		Standard range	limits	
<p>Treatment for exceeding allowable limits:</p> <p>(1) When $3 < a \leq 5$, leg length shall be increased by (a-2)</p> 	≤ 3	≤ 2		
<p>(2) When $5 < a \leq 15$,</p> <p>① add filler or do built up welding, if filler is removed, back-up welding must be adopted</p> 				

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Items		Standard range	Allowable limits	Remarks
		a/2	a/2	Treatment for exceeding allowable limits (1) When 3-weld leg length is to be increased by (a/3) (2) When a/2 fixing is required

1.5.1.2 Deviation of lapping gap is to be kept within the limits as defined in table 3-1-20.

mm

Table 3-1-20

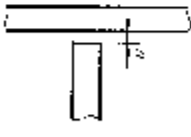
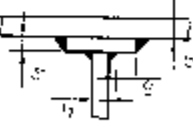
Items		Standard range	Allowable limits	Remarks
	Gas butore + let welding	a/2	a/2	(1) odd part plate and no welding. The pad thickness t_1 shall be $a/4 \leq t_1 \leq a/2$
				
				(2) When $a \geq 1.5$, remove the plate with cutting height ≥ 50 mm

Table 3-1-19 (end)

mm

7.5.1.3 Deviation of built welding joints is to be kept within the limits as defined in table 3-1-21.

mm

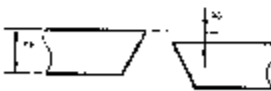
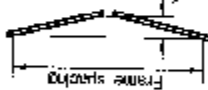
Items	Standard	range	Allowable limits	Remarks
Misalignment		Primary members	$\leq 0.1a$ and ≤ 3	Those exceeding allowable limit are to be refixed with misalignment of a thickness of smaller plate
		Secondary members	$\leq 0.15a$ and ≤ 3	
Flatness			≤ 2.0	Those exceeding allowable limit are to be flattened by cutting technological plates
			≤ 2.0	

Table 3-1-21

mm

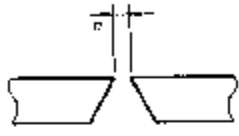
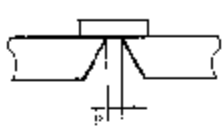


Items	Standard	range	Allowable limits	Remarks
Gap between joints by manual welding		2~3.5	≤ 0.5	(1) When $a \leq 15$ (a) Add backing material and weld the joint (b) Remove backing material and finish back weld Treatment for exceeding allowable limits
			≤ 0.5	
				

Table 3-1-21 (continued)

mm

Standard Allowable range limits	Remarks
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Between butt welds</p> </div> <div style="text-align: center;">  </div> </div>	<p>In case the details of construction are not defined in the approved plans, they shall be decided by mould setting or in shop drawings, they are to be decided within the limits as given in the sketch shown left.</p>

77-1-8 200

4444

1.5.1.4 Distance between welds is to be in accordance with the limits as defined in table 3-1-22.

Items	Standard range	Allowable limits	Remarks
Gap between roots by manual welding	2-3.5	≤ 0.0	<p>(a) Add backing material. Weld from room side only after one slope of the joint is in correct form dimension</p> <p>(b) Remove backing material and flush back weld</p>
			<p>(c) When $16 \leq d \leq 25$</p>
			<p>(d) When $d > 25$, leave the joint partly and flush</p>

(end) 8-1-21

14.400

Items	Flat		Curved		Standard range	Allowable limits	Remarks
	Flat	Curved	Flat	Curved			
Breadth of sub-assembly	Flat	Curved	-4	± 8			
Length of sub-assembly	Flat	Curved	+4	± 8			
Squareness of sub-assembly	Flat	Curved	4	8			Diagonals of final packing
Position of sub-assembly			10	20			Measured on face plates of beam or girder

Table 3-1-23

mm

1.5.2. Sub-assembly
1.5.2.1 Accuracy of installation dimensions for flat and curved sub-assemblies is to be in compliance with the requirements as defined in Table 3-1-23.

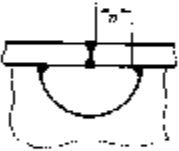
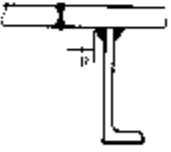
Items	Primary members		Secondary members		Standard range	Allowable limits	Remarks
	Primary members	Secondary members	Primary members	Secondary members			
Between butt weld and fillet weld			—	—	—	—	
	≥ 5.0	≥ 5.0	—	—	—	—	
	≥ 10	≥ 10	—	—	—	—	

Table 3-1-22 (end)

mm

Items	Standard		Remarks
	range	limits	
Controls of upper and lower planes	Flat block ≤ 5	Curved block ≤ 10	Method of measuring: Take two points of the main plane to form a plane and measure the deviation of another point against this plane
Form lines of upper and lower planes	Flat block ≤ 6	Curved block ≤ 10	
Twist of assembly (for rigid back assembly)	Flat block 10	20	Method of measuring: Take two points of the main plane to form a plane and measure the deviation of another point against this plane
	Curved block	15	
Height of members at same level	14	10	Height of member at two different levels
Others: same as for plans and curved sub-assembly in table 3-1-23	-3	10	

1.5.2.2 Accuracy of installation dimensions of block assemblies is to be in compliance with the requirements as defined in table 3-1-24.

Items	Standard		Remarks
	range	limits	
Distances between upper and lower members: a	-5	+10	Distance between off ridge of bus and off peak or knick: b
Inclination of sub-assembly: c	0	10	
Deviation of rubber post centreline from shaft centreline: d	≤ 4	≤ 8	Others: same as for those in table 3-1-24
Deviation of rubber post centreline from theoretical centreline of rubber: e	-5	+10	

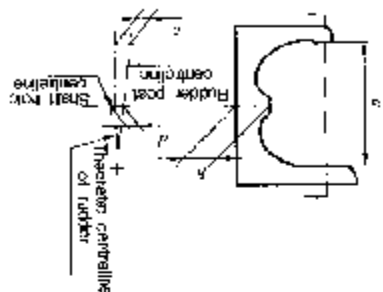


Table 3-1-25

1.5.2.3 Accuracy of installation dimensions of block assemblies of steering frame is to be in compliance with the requirements as defined in table 3-1-25.

Items		Standard range	Allowable limits	Remarks
Centrair use	Double bottom sub-assembly and shipway	≤ 3.0	≤ 5.0	
	Deck, platform, transverse bulkhead and double bottom	≤ 5.0	≤ 8.0	
	Fore/cft terminal points and shipway	$< 0.13\% A$ & $< 10.15\% A$		A is height of fore/cft terminal points
	Superstructure and deck	≤ 4.0	≤ 8.0	
	Centrelines of upper rudder carrier and shipway	≤ 4.0	≤ 8.0	
	Centre of stern shaft hole and centrelines of shipway	≤ 5.0	≤ 5.0	

Table 3-1-27

Assembling deviation on the shipway is to be kept within the limits as defined in table 3-1-27.

1.5.3 Assembling on shipway

Items		Standard range	Allowable limits	Remarks
Flatness of base plate of main engine foundation	≤ 0.5		≤ 1.0	
	Length and breadth of base plate of main engine foundation	± 4	± 6	If the foundation is of longitudinal girder construction, measure the deviation from the centerline
Others same as for those in table 3-1-24				

Table 3-1-26

1.5.2.4 Accuracy of installation dimensions of assemblies including main engine foundation is to be in compliance with the requirements as defined in table 3-1-26.

Items	Standard range	Allowable limits	Remarks
Height of bead, h	≤ 0.28	≤ 0.31	h is breadth of bead
Frank angle, θ	$\leq 60^\circ$	$\leq 90^\circ$	

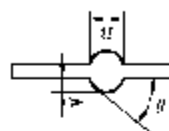
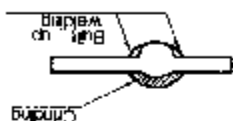


Table 3-1-28

mm

1.6 Welding

1.6.1 Deviation of welding dimensions is to be kept within the limits as defined in table 3-1-28.

Items	Standard range	Allowable limits	Remarks
Levelness of four corners of bottom platform and deck	± 5.0	± 10.0	
Levelness of bulkhead/port/storboard, fore/aft	± 4.0	± 6.0	
Levelness of side sub-assembly (fore/aft)	± 5.0	± 10.0	
Levelness at four corners of superstructure	± 10.0	± 15.0	
Bulkhead	± 3.0	± 6.0	
Side sub-assembly	± 5.0	± 8.0	
Superstructure	± 10.0	± 15.0	
Frame spacing at sub-assembly joint	± 10.0	± 20.0	
Perpendicularity of bulkhead	$<0.1\%$ & and $<0.12\%$ &	λ is height of bulk-head	

Table 3-1-27 (end)

mm

Items	Standard range	Allowable limits	Remarks
300M-high tensile steel		≥30	
Grade 5 mild steel		≥30	

1.6.4 Requirements for short bead, tack welding bead and repairing bead are as defined in table 3-1-31.

Items	Standard range	Allowable limits	Remarks
Specified dimension of welding, K_1 Actual dimension of welding, K_2 Specified throat depth, A_1 Actual throat depth, A_2		$K_1 \geq 0.9K_2$ $A_1 \geq 0.9A_2$	In case it is not within allowable limits, weld-up over it with the electrodes is required

1.6.3 Deviation of dimensions of fillet welds is to be kept within the limits as defined in table 3-1-30.


Items	Standard range	Allowable limits	Remarks
Butt weld			
Primary members		≤ 0.5	
Secondary members		≤ 0.8	
Fillet weld			
		≤ 0.8	

1.6.2 The requirements for weld under cuts are defined in table 3-1-29.

1.6.5 Arc-strikes to be in compliance with the requirements as defined in table 3-1-32.

Items	Standard range	Allowable limits	Remarks
100 Mils 1/8th tensile steel, Grade E mild steel, cast steel	—	Not allowed	(a) Weld over a short bead over 30 mm on the inside (b) Remove the hindered zone by grinding

1. 6. 6 Welding joint distortion is to be kept within the limits as defined in table 3-1-33.

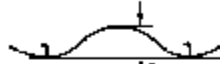
Items	Standard range	Allowable limits	Remarks
Short plate between 0.4 L and 0.6 L and 0.4 L and 0.6 L Short plate at fore and aft ends Errors:	 C is distortion of short plate in frame soon	≤ 3 ≤ 3	In case it exceeds allowable limits it is to be repaired or rewelded after correcting and cutting

1.7 Fairness and Finishing

4.7.4. For mess

1.7.1.1 Local fairness is to be in compliance with the requirements as defined in table 3.1.34.

Table 3-1-34

Items	Standard range	Allowable range	Remarks
Parallel midbody (side plate, bottom plate)	≤ 0.4	≤ 0.6	 <p>For every frame spacing t is</p>
Shell plate			
Core and all curved parts	≤ 0.5	≤ 0.7	For every frame spacing t is
Tank top plate	≤ 0.4	≤ 0.6	
Double bottom			Thickness
Falkten	≤ 0.5	≤ 0.6	

Items		Standard range	Allowable limits	Remarks
Shell plate	Parallel midbody	$\pm 2.7/1.000$	$\pm 2.7/1.000$	Measuring method: Minimum measuring length $L=3$ m (oil about 5 m for bulkhead and outside wall)
	Fore and aft ports	$\pm 3.7/1.000$	$\pm 4.7/1.000$	
Deck, platform and tank top		$\pm 3.7/1.000$	$\pm 4.7/1.000$	
Bulkhead		$\pm 4.7/1.000$	$\pm 5.7/1.000$	
Superstructure	Back	$\pm 3.7/1.000$	$\pm 4.7/1.000$	
	Outside wall	$\pm 2.7/1.000$	$\pm 3.7/1.000$	
Others		$\pm 3.7/1.000$	$\pm 6.7/1.000$	

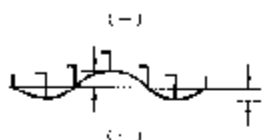


Table 3-1-35

1.7.1.2 Overall fairness is to be in compliance with the requirements as defined in table 3-1-35.

Items		Standard range	Allowable limits	Remarks
Upper deck	Parallel midbody (including longitudinal and transverse structure)	≤ 4	≤ 6	
	Fore and aft ports	≤ 6	≤ 8	
Second deck	Non-exposed part	≤ 7	≤ 9	
	Exposed part	≤ 6	≤ 8	
	Non-exposed part	≤ 7	≤ 9	
	Exposed part	≤ 4	≤ 6	
Superstructure deck		≤ 7	≤ 9	
House walls		≤ 6	≤ 8	
Both sides of non-exposed part		≤ 7	≤ 9	

Table 3-1-34 (cont)

mm

1.7.1.3 Straightness of inner supporting members is to be in compliance with the requirements as defined in table 3-1-36.

Table 3-1-36

Remarks	Allowable limits		Standard range	Remarks
	mm	mm		
Main members, such as strength coam, web frame, floor and deep deck	≤ 3	≤ 3		Other members, such as longitudinal frame, boom and sillener, with length L_1 $L_1 \geq 1$ mm $L_1 < 1$ mm
	≤ 8	≤ 10		
"H" type pillar between decks	≤ 1	≤ 5		Other supports
	≤ 10	≤ 10		

1.7.2 Finishing

1.7.2.1 Staging sockets and lifting eye pieces are to be finished according to the requirements as defined in table 3-1-37.

Table 3-1-37

Items	Requirements		Remarks
	Staging sockets	Lifting eye pieces	
In water and oil tanks	May be retained totally		
In engine room	Only those affecting appearance and passage is to be removed		
In cargo hold	Only those at lower level and on which stowage is to be removed		
On exposed part of shell	To be removed totally		
In water and oil tanks and upper deck, etc.		May be retained provided not affecting passage	
In cargo hold		To be removed totally	
Or exposed part of shell and upper deck, etc.		10 mm of coat may be retained on back side of deck plate	
Or exposed part of shell and upper deck, etc.		To be removed totally	

(2) Such pieces may be removed by gas cutting or other process, not

may be retained, but for parts

essentially important to strength,

but lap welding is to be made to

smooth and fitting of the full rig

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1.7.2.2 Temporary pieces are to be finished according to the requirements as defined in table 3-1-38.

Items	Requirements	Remarks
Where good appearance is required	Outside surface of shell plate, deck and superstructure are to be chipped flush and smooth. Under-cut of temporary pieces may have a depth of 0.5 mm. Above this limit the strength deck with under cuts welded cut is to be welded over and grinded flush.	
Where good appearance is not required	Temporary pieces inside holds and similar pieces are to be chipped all if they are at partially conspicuous places. Under-cut may have a depth of 0.5-1.0 mm and a length not more than 30 mm. Over these limits they are to be welded over and finished, but may be not chipped off and grinded.	

Table 3-1-38

1.7.2.3 Holes made erroneously are to be treated according to the requirements as defined in table 3-1-39.

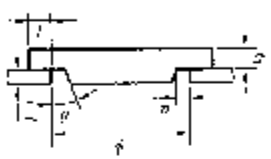
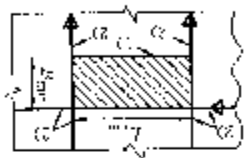
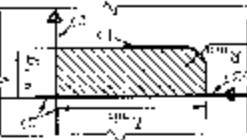
Items	Allowable limits	Method of treatment
Main strength members on sole plate or upper deck	(1) Cut an opening over 75% diameter, then treat by method A; (2) Cut an opening over 20% in diameter, then treat by method B	A: Spigot patch; B: 
$\phi < 200$		$t = 3.0$ $a = 4 \sim 6$ $b_1 = 0.5 t \sim 1.2$ $b = 30^\circ \sim 40^\circ$
Others	Cut an opening over 20% in diameter, then treat by method A, or B	

Table 3-1-39

TRM


Terms	Allowable limits	Method of treatment
Minimum length of insert L_{min}	500	
Minimum breadth of insert piece B_{min}	100	
Recoring by insert		
Minimum roundness of insert piece R_{min}	5 times plate thickness, out ≥ 100	<p>(1) Seam with insert piece is to be welded first</p> <p>(2) If no seal is to be welded over at least for 100 at one end</p> <p>(3) R is 5 times plate thickness, minimum thickness is 100</p>

07-1-2 0100

111

3-1-40.

1.7.2.4 Repairing by insert piece is to be done according to the requirements as defined in table

Items	Allowable limits	Method of treatment
Main strength members on sheer plate or under deck	Treat by method B	B. Repair and weld by insert plate C. Built up and coat by top welding (to same thickness as base plate)
Others	Treat by method B or C	
Triangular opening, steel op. rectangular opening	Treat by method B or C	D. If it is difficult, treat around joint of view is not an opening over 200 in diameter, it may be processed by low hydrogen electrode after radiographic examination or ultrasonic inspection

(end) 3-1-39

www

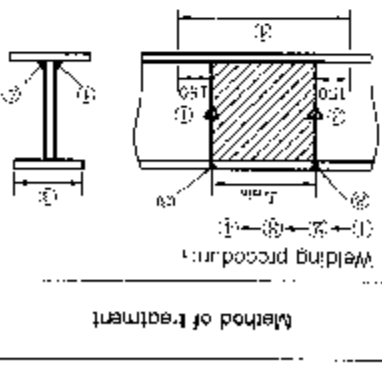
Items	Repairing welding by insert piece or composite lift
Minimum length of insert piece, L_{min}	
Allowable limits	300
Method of treatment	

Table 3-1-40 (end)

1.8.1 Deviation of principal dimensions is to be kept within the limits as defined in Table 3-1-41.

Items	Standard range	Allowable limits	Remarks
Overall length or length between perpendiculars, L	$\pm 1/1000$	Not specified	
Moulded breadth, B	$\pm 1/1000$	Not specified	
Moulded depth, D	$\pm 1/1000$	Not specified	

Table 3-1-41

1.8.2 Deformation of hull form is to be kept within the limits as defined in Table 3-1-42.

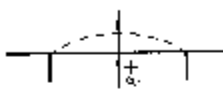
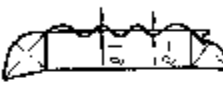
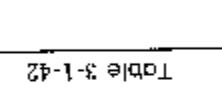
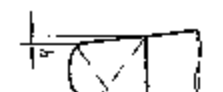
Items	Standard range	Allowable limits	Remarks
Deflection of keel between adjacent bulkheads		± 15	
Deflection between peak lanks		± 25	
Within whole length between fore and aft bulkheads		± 35	
Warping-up		± 30	
Locking-up of bow, δ		± 10	

Table 3-1-42

mm

Items	Deviation in regard to the template	
	Standard range	Allowable limits
	± 1.0	± 1.0
Remarks		

mm

Table 3-1-44

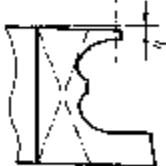
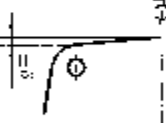
1.9.2 Deviation of freeboard mark is to be kept within the limit as defined in table 3-1-44.

Items	Deviation in regard to the straight rule	
	Standard range	Allowable limits
	± 1.0	± 2.0
Remarks		

mm

Table 3-1-43

1.9 Draught and freeboard marks
1.9.1 Deviation of draught mark is to be kept within the limit as defined in table 3-1-43.

Items	Warping-up	
	Warping-up of stern, A	Transversely warping up or sagging-down
		
Standard range	± 20	± 15 (per 10m of breadth)
Allowable limits	± 30	± 25 (per 10m of breadth)
Remarks		

mm

Table 3-1-42 (end)

2 HULL OUTFITTING

181

2.1 Rudder

2.1.1 The rudder plate and rudder stock are to be manufactured in accordance with the requirements as defined in table 3-2-1.

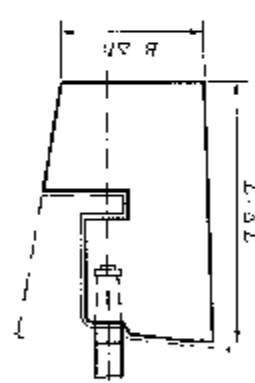
Items		Standard range	Allowable limits	Remarks
 Rudder plate	Deviation of rudder plate height, ΔL	± 4	—	
	Deviation of rudder plate width, ΔB	4	—	

Table 3-2-1

mm

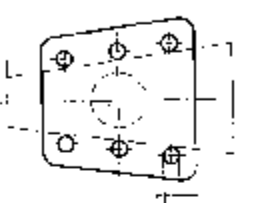
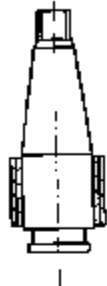
Items		Standard range	Allowable limits	Remarks
 Corner bolt	Roundness of bolt hole	≤ 0.01	≤ 0.01	
	Cylindricity of bolt hole	≤ 0.02	≤ 0.02	
	Roundness of bolt	≤ 0.01	≤ 0.01	
	Cylindricity of bolt	≤ 0.02	≤ 0.02	
	Oversize of bolt, ΔD	$0.005 \sim 0.015$	≥ 0	ΔD is hole diameter

Table 3-2-1 (continued)

mm

Table 3-2-1 (end)			
Items	Standard range	Allowable limits	Remarks
Contact area between upper part and rudder plate 	> 60%	> 60%	
Oversize of pinle when filled with stainless steel sleeve: $d_1 - d_2$ Oversize of pin le when filled with bronze sleeve: $d_1 - d_3$	$(5 \sim 10)d_1$ 10.000 $(5 \sim 10)d_2$ 10.000	$(5 \sim 10)d_1$ 10.000 $(10 \sim 20)d_2$ 10.000	d_1 is outside diameter of pinle d_2 is inside diameter of sleeve

Page 1 of 1

Table 3-2-2

Items	Standard range	Allowable limits	Remarks
Over-size when fitted with stainless steel bush, $d_1 - d_2$	0 ~ 0.05	0 ~ 0.05	
Over-size when fitted with bronze bush, $d_1 - d_2$	0 ~ 0.05	0 ~ 0.05	d_2 is outside diameter of bush
Over-size when fitted with aluminum-vitric bush, $d_1 - d_2$	0 ~ 0.05	0 ~ 0.05	d_2 is inside diameter of guidoon
Over-size when filled with phenolic resin bush, $d_1 - d_2$	0 ~ 0.05	0 ~ 0.05	

Table 3-2-2 (continued)

Items	Standard range	Allowable limits	Remarks
Oversize with cylindric part of rudder stock Oversize with key Contact area with rudder stock taper	>0 $0.005 \sim 0.015$ $>60\%$	>0 $>60\%$	
Contact area between rudder carrier and friction disk Clearance between rudder carrier and friction disk, ΔL	$>10\%$ 0.05	$>50\%$ 0.15	

Items	Deviation of diameter	Straightness
Standard range	$(L)/200$ but max. ± 5.0	$\leq 1/1000 L$ and ≤ 10
Allowable limits	$\pm D/150$ but max. ± 7.5	$\leq \frac{1.5}{1000} L$ and ≤ 15
Remarks	D is diameter of post	L is total length

mm

Table 3-2-3

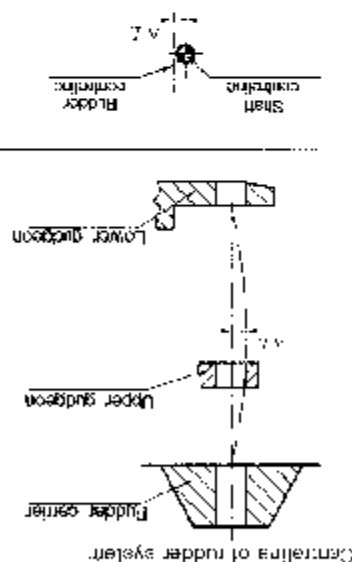
defined in table 3-2-3.

2.2 Mast, deck crane post and derrick boom
2.2.1 Mast and deck crane post are to be manufactured in accordance with the requirements as

Items	Deviation of rudder centreline for rudder cars, upper and lower gudgones after boring (in both fore and aft direction) ΔL at two (strip direction) ΔL	Offset of rudder centreline and steering control ΔL
Standard range	≤ 0.3	≤ 1
Allowable limits	≤ 0.5	≤ 2
Remarks		

mm

Table 3-2-2 (end)



Appendage				Items	Remarks
				Roundness at the installing place of fork head of boom	≤1
				Deviation angle between fork head of boom and eyeplate	≤1°
				Deviation angle between fork head of boom and eyeplate	≤2°
				Allowable limits	
				Standard range	
				Remarks	

Table 3-2-4 (end)

Derrick boom				Items	Remarks
				Deviation of length, ΔL	±2
				Linearity	≤5
				Deviation of diameter, ΔD	± $\frac{D}{100}$
				Allowable limits	
				Standard range	
				Remarks	

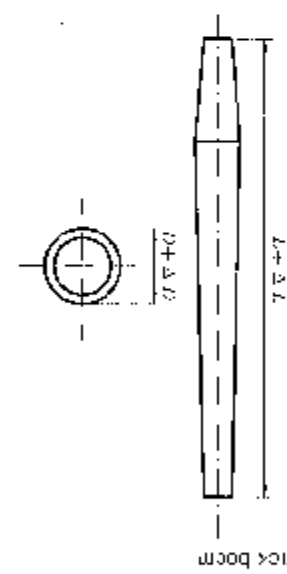


Table 3-2-4

2.2.2 Derrick boom is to be manufactured in accordance with the requirements as defined in table 3-2-4.

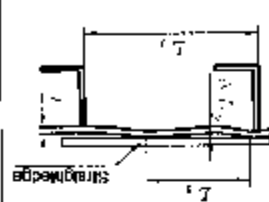
Items			Standard range	Allowable limits	Remarks							
 <p>Local deformation of top plate</p>						L_1 (7-11-9)		ΔL_1		In case the measuring distance L_1 between two contact points is larger than the distance L_2 between the stiffeners, the L_1 value shall be added.		
						L_2 (7-11-12)		ΔL_2			≤ 100	≤ 3
											$> 400 \sim 600$	≤ 4
						$> 600 \sim 800$		ΔL_3			≤ 5	≤ 5
											$> 800 \sim 1000$	≤ 6
						$> 1000 \sim 1200$		ΔL_4			≤ 7	≤ 8
											≤ 400	≤ 9
						$> 100 \sim 500$		ΔL_5			≤ 1	≤ 1
											$> 800 \sim 1000$	≤ 5
						$> 600 \sim 800$		ΔL_6			≤ 3	≤ 3
											$> 1000 \sim 1200$	≤ 5
						$> 800 \sim 1000$		ΔL_7			≤ 5	≤ 5
											$> 1000 \sim 1200$	≤ 7

Table 3-2-6 (continued)

mm

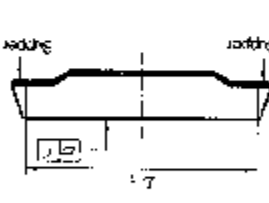
Items		Standard range		Allowable limits	Remarks
Panes of single cover panel (i.e. deformation of the panel (i.e. deformation of the region formed by girders within the panel)) 	Max. length of the girders at the panel, l_p	≤ 5000	≤ 5000	≤ 5	The measuring shall be done at the supported part on as that on board the ship.
	$> 5000 \sim 15000$	l_p	≤ 8	≤ 8	
	$> 15000 \sim 25000$	≤ 10	≤ 12		
	> 25000				

Table 3-2-6 (continued)

mm

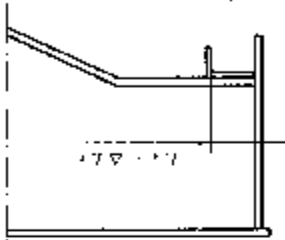
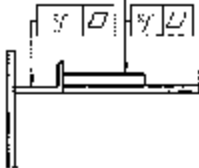
Items		Standard range		Allowable limits	Remarks
Coen type structure - A			AL		For local measuring, the deviation of level rose shall be kept within 2 mm.
			<3000		
			>3000~7000		
			>7000~25000		
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
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f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
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f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
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f ₁	f ₂	f ₃	f ₄	f ₅	
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f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
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f ₁	f ₂	f ₃	f ₄	f ₅	
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f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
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f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂	f ₃	f ₄	f ₅	
f ₁	f ₂				

Table 3-2-6 (continued)

mm

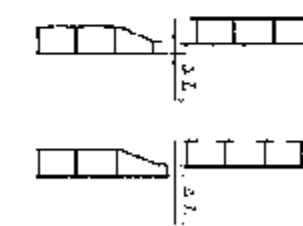
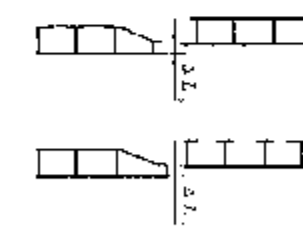
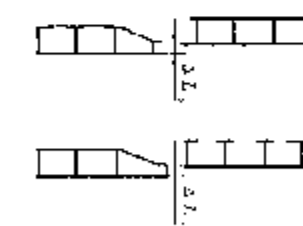
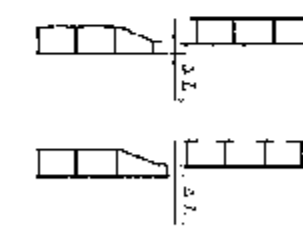
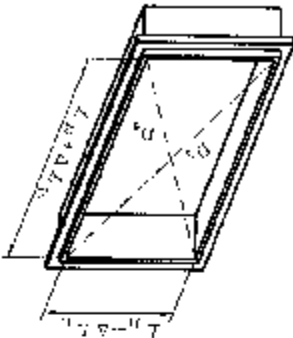
Items		Standard range		Allowable limits	Remarks		
		Conventional hatchcover		ΔL_1	=1	For local measuring, the deviation of level rose shall be kept within 2 mm.	
		Hatchcover for carrying evenly loaded containers and hatchcover for tweendeck of reeler with wooden gratings		ΔL_2			
		Hatchcover for tweendeck of reeler with wooden gratings		ΔL_3			
		Hatchcover for tweendeck of reeler with wooden gratings		ΔL_4			
		Hatchcover for tweendeck of reeler with wooden gratings		ΔL_5	=1	For local measuring, the deviation of level rose shall be kept within 2 mm.	
		Hatchcover for tweendeck of reeler with wooden gratings		ΔL_6			
		Hatchcover for tweendeck of reeler with wooden gratings		ΔL_7			
		Hatchcover for tweendeck of reeler with wooden gratings		ΔL_8			
Hatchcover for tweendeck of reeler with wooden gratings		ΔL_9	ΔL_{10}	ΔL_{11}	ΔL_{12}	ΔL_{13}	ΔL_{14}

Table 3-2-6 (continued)

mm

Remarks		Standard range		Allowable limits		Items	Deviation of dimensions of hatch coaming opening							
						> 1000~2000	> 2000~4000	> 7000~8000	> 5000~12000	> 18000~15000	> 16000~20000	> 20000~24000	> 24000~28000	> 28000
										ΔL_{11} or ΔL_{12}				

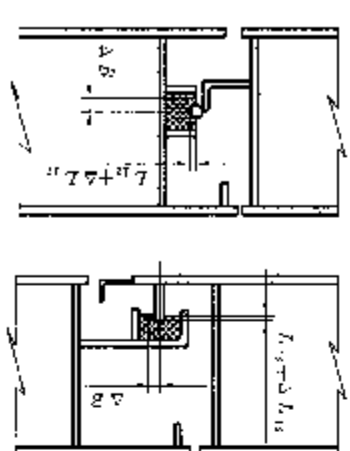
Remarks		Standard range		Allowable limits	
Items	Regular and rubber with leaned core		Size 32 x 71 $L_{12}=8$	ΔB	≤ 6
				ΔL_2	± 1
				ΔB	≤ 6
				ΔL_1	± 2
The normal rubber compression is one-fourth of rubber thickness	Size 40 x 71 $L_{12}=10$	ΔB	≤ 8		
		ΔL_1	± 3		
		ΔB	≤ 7		
		ΔL_2	± 2		

Table 3-2-8

2.3.3 The installation of sealing rubber is to be in accordance with the requirements as defined in Table 3-2-8.

Table 3-2-7 (end)				
Items		Standard range	Allowable limits	Remarks
Compression of bar to be fixed later (adjustable)	≤ 3.00	≤ 2	≤ 3	For local measurement: The deviation should be kept within 2 mm or every 1 meter length
	$> 8000 \sim 13000$	≤ 3	≤ 4	
	$> 13000 \sim 28000$	≤ 4	≤ 5	
	≤ 7000	≤ 2	≤ 3	
Compression bar to be fixed before hand (workload) etc.	≤ 28000	≤ 2	≤ 3	
	≤ 14000	≤ 2	≤ 3	
Without compression bar (sliding rubber)	≤ 29000	≤ 3	≤ 4	
	≤ 25000	≤ 3	≤ 4	

Levelness of top plate of door

Compression range 100

Decrease of angle 1.0mm/100.0mm

Length of compression bar

Table 3-2-7 (end)

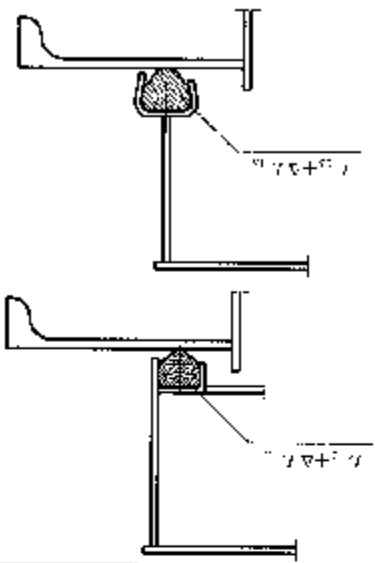
Items			
			
Sliding rubber	Solid 57×12 $L_{11}-7$ ΔL_{11} $L_{11}-11$ Hollow 62×20 $L_{11}-12$ ΔL_{11}	Standard range ± 2 ± 6 Allowable limits ± 3 ± 7 ± 8	Remarks

Table 3-2-8 (end)

mm

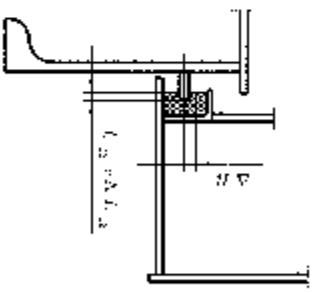
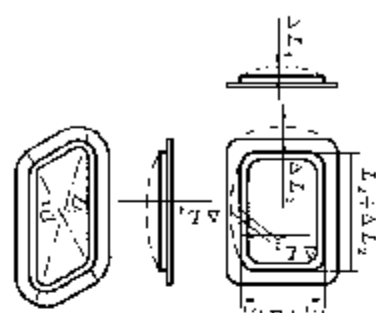
Items			
			
Rectangular rubber with bonded core	Size 30×120 $L_{12}-13$ ΔL_{12} Size 50×93 $L_{12}-12$ ΔL_{12}	Standard range ± 2 ± 3 Allowable limits ± 3 ± 7 ± 8	Remarks

Table 3-2-8 (continued)

mm

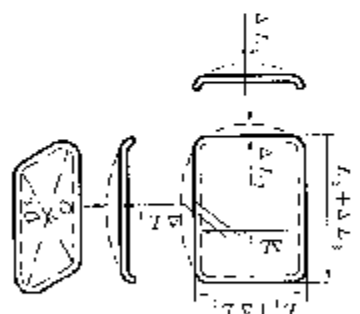


Items						Standard range		Allowable limits	Remarks
Deviation of breadth, ΔL_1		± 2		± 4					
Deviation of height, ΔL_2		± 2		± 4					
Difference between angles of diagonals, D_1, D_2		± 2		± 4					
Degree of distortion		≤ 2		≤ 4		Degree of distortion is distance between middle points of two diagonals			
Straightness, ΔL_3		≤ 1		≤ 3					
Flatness, ΔL_4		≤ 2		≤ 3					

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Table 3-2-10 (continued)

UJL



Items			
	Position of creatch: ΔL_1	L2	±4
	Deviation of height: ΔL_1	L2	+4
	Difference between lengths of diagonals: $\Delta L_1, \Delta L_2$	±2	-4
	Region of distortion	≤12	≤3
Strightness: ΔL_1	≤1	≤3	
Planeness: ΔL_1	≤2	≤3	

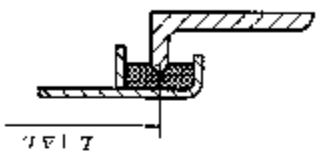
Standard	Allowable	Remarks
range	limits	
L2	±4	

Table 3-2-10

4449

2.4 Weatherlight closing devices

2.4.1 The manufacture and installation of weatheright doors is to be in accordance with the requirements as defined in table 3.2.10.

Items				Remarks
Standard range		Allowable limits		
range		limits		
Deviation of sill height		-15 0	0 15	
Verticality of door centre		$\leq \frac{2L}{1000}$	$\leq \frac{2L}{1000}$	
Deviation of distance of seat to door centre, ΔL		12	2	

mm

Table 3-2-10 (end)

Table 3-2-10 (end)

mm

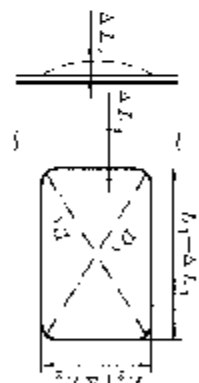
Items				
Deviation of height, ΔL ₁		Deviation of width, ΔL ₂		
Standard range	Allowable limits	Standard range	Allowable limits	
±4	±6	±1	±3	
		±2	±10	
		±3	±3	
</				

Table 3-2-10 (continued)

mm

Items		Door frame			
Standard range	Deviation of breadth, ΔL_1	± 1.0	± 1.0	± 1.0	
	Deviation of height, ΔL_2	± 1.0	± 1.0	± 1.0	
	Deviation of depth, ΔL_3	± 2.0	± 2.0	± 2.0	
	Difference between lengths of diagonals, $D_1 - D_2$	± 2.0	± 2.0	± 4.0	
	Degree of distortion	≤ 2.0	≤ 2.0	≤ 2.0	Degree of distortion is distance between middle points of two diagonals
Straightness, ΔL_4		< 1.0	< 1.0	< 1.0	
Remarks		Allowable limits			

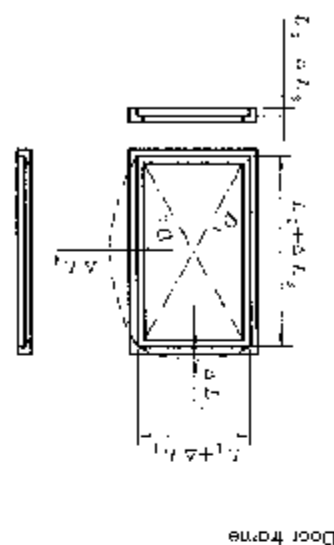


Table 3-2-11 (continued)

mm

Items		Door			
Standard range	Deviation of breadth, ΔL_1	± 1.0	± 1.0	± 1.0	
	Deviation of height, ΔL_2	± 1.0	± 1.0	± 1.0	
	Deviation of thickness, ΔL_3	± 1.0	± 1.0	± 1.0	
	Difference between lengths of diagonals, $D_1 - D_2$	± 2	± 2	± 4	
	Degree of distortion	≤ 2.0	≤ 2.0	≤ 2.0	Degree of distortion is middle points of two diagonals
Straightness, ΔL_4		< 1.0	< 1.0	< 1.0	
Planeness, ΔL_5		≤ 1.0	≤ 1.0	≤ 1.0	
Remarks		Allowable limits			

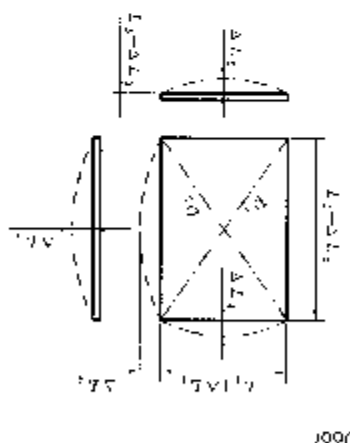


Table 3-2-11

mm

2.4.2 The manufacture and installation of fire-proof door is to be in accordance with the requirements as defined in table 3-2-11.

Items		Standard range	Allowable range	Remarks
Hatch covering	Deviation of length, ΔL_1	±2	±1	
	Deviation of breadth, ΔL_2	±2	±1	
	Distance between lengths of diagonals, D_1, D_2	±2	±1	
	Deviation of height (lowest point), ΔL_3	0	+20	
	Degree of distortion is distance between middle points of two diagonals	≤3	≤3	
	Degree of distortion is distance between middle points of two diagonals	≤3	≤3	
	Straightness, ΔL_1	≤3	≤3	
	Planeness, ΔL_1	≤3	≤3	

Table 3-2-12 (continued)

mm

Table 3-2-12 (continued)

mm

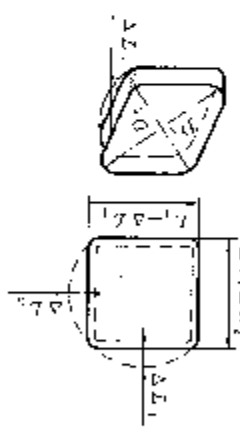
Items		Standard		Allowable		Remarks
		range		range		
		mm		mm		
	Deviation of breadth, ΔL_1		±3	±5		
	Deviation of height, ΔL_2		±3	±5		
	Difference between lengths of diagonals, D_1, D_2		±2	—4		
	Degree of distortion		≤2	≤3		
	Straightness, ΔL_1		≤1	≤3		
	Planeness, ΔL_1		≤3	≤3		

Table 3-2-12

mm

2.4.3 The manufacture and installation of weatherlight small hatchcover is to be in accordance with the requirements as refined in table 3-2-12.

Items		Standard range		Allowable limits	Remarks
Cover	Deviation of diameter, ΔD	J 3		J	
	Roundness	K 2		K 3	
	Planeness, ΔL	L 1		L 3	

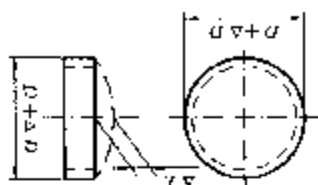
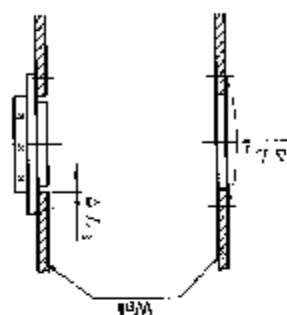


Table 3-2-13

2.4.4 The manufacture and installation of circular weatherlight fastener is to be in accordance with the requirements as defined in table 3-2-13.

Items		Standard range		Allowable limits	Remarks
Deck plate opening	Deviation of breadth, ΔL_1	+2		±3	
	Non-penetration type	+2		±3	
	Penetration type	+2		±3	
	Deviation of length, ΔL_2	±2		±3	
	Non-penetration type	±2		±3	
Water tight structure	Deviation of length, ΔL_3	±2		±3	
	Non-penetration type	±2		±3	
	Penetration type	±2		±3	
	Deviation of breadth, ΔL_4	±2		±3	
	Non-penetration type	±2		±3	
Touch between gasket and coaming		N 1/2		N 1/2	
Distance between lengths of diagonals, $I_1 - I_2$		±2		±4	
Remarks		Remarks		Remarks	

Table 3-2-12 (end)

Items	Standard range	Allowable limits	Remarks
			
Flatness of wall at cut, ΔL_1	≤ 2	≤ 3	
Clearance between window frame and cut, ΔL_2	≤ 1	≤ 2	

2.4.5 The installation of rectangular window 8 to be in accordance with the requirements of table 3-2-14.

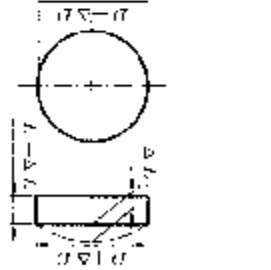
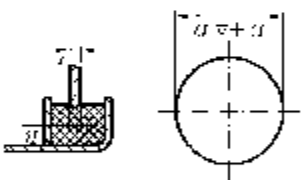
Items	Standard range	Allowable limits	Remarks
			
Hatch opening			
Deviation of diameter, ΔD	± 2	± 3	
Deviation of height, ΔH	-4	-20	
Roundness	≤ 0	≤ 5	
Planeness, ΔL_1	≤ 1	≤ 3	
Deviation of diameter, ΔD	± 2	± 3	
Touch between gasket and coaming			
			
Cut in deck plate and water tightness			

Table 3-2-13 (continued)

mm

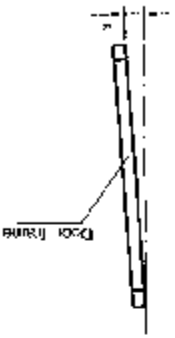
Items		Remarks	
		Standard range	≤ 1
		Allowable limits	≤ 2

Table 3-2-16

2.5 Cabin outfitting
 2.5.1 The installation of door and door frame is to be in accordance with the requirements of table 3-2-16.

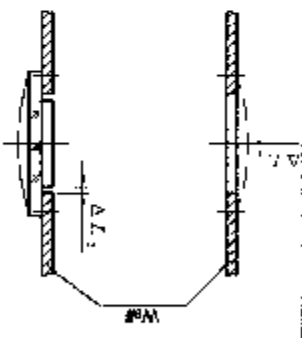
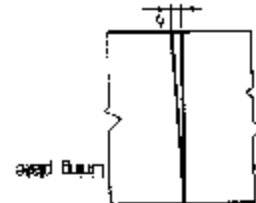
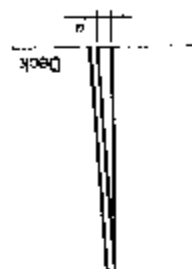
Items		Remarks	
		Standard range	≤ 1.0
		Allowable limits	≤ 1.5

Table 3-2-15

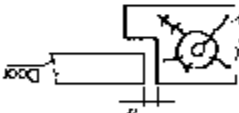
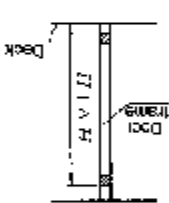
2.4.6 The installation of side scullie is to be in accordance with the requirements of table 3-2-15.

Items		Verticality of seam of lining plate, b	≤ 3	≤ 3
Items		Verticality of lining, a	≤ 5	≤ 7
Standard range			Allowable limits	Remarks

mm

Table 3-2-17

2.5.2 Installation of lining and ceiling is to be in accordance with the requirements as defined in table 3-2-17.

Items	Clearance between wooden door and door frame, a		Deviation of installed height of frame, H	
				
	Clearance at hinge side		Lower crack	
	Upper crack			
	Clearance of lock side			
Standard range	≤ 2	≤ 2	≤ 4	$-3 \sim 10$
Allowable limits	≤ 3	≤ 3	≤ 4	$-5 \sim 12$
Remarks				

mm

Table 3-2-16 (end)


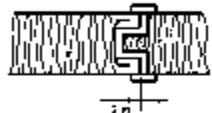
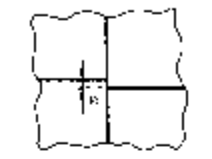
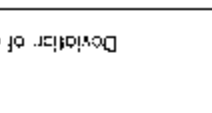


Items	Clearance between ceiling plates		Misc. joint of ceiling plates, α		Deviation of clear height of ceiling	
	With strip, α	Without strip, α	With strip, α	Without strip, α	With strip, α	Without strip, α
						
	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0
	≤ 1.5	≤ 1.5	≤ 2.0	≤ 2.0	≤ 1.5	≤ 1.5
Remarks	Allowable limits		Standard range		—	

Table 3-2-17 (end)

mm

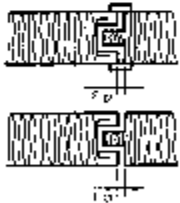
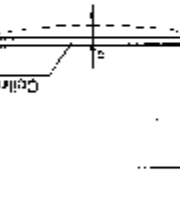

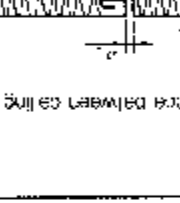
Items	Clearance between lining plates		Engaging of ceiling plate, α	
	With strip, α	Without strip, α	With strip, α	Without strip, α
				
	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0
	≤ 1.5	≤ 1.5	≤ 2.0	≤ 2.0
Remarks	Allowable limits		Standard range	

Table 3-2-17 (continued)

mm

Foundation		Items		Standard range	Allowable limits	Remarks
Foundation	Deviation of web plate of engine foundation (longitudinal girder) from ship centreline	± 4	± 5			
	Planeness of face plate of engine foundation	≤ 5	≤ 10			Locally displaced and small amount deviation from the limit is allowed
	Height deviation of face plate from ship baseline	≤ 3	≤ 5			
	Outward taper of face plate	$1:100$				



mm

Table 3-3-1

The installation of diesel main engine and manufacture of fastening accessories are to be in accordance with the requirements as defined in table 3-3-1.

3 MACHINERY INSTALLATION

3.1 Diesel main engine

Items		Standard range	Allowable limits	Remarks
	a Thickness of deck covering.	≤ 2.5	≤ 3.0	per meter
	b Planeness of plastic deck.	≤ 2.5	≤ 3.0	per meter

mm

Table 3-2-18

2.5.3 The application of deck covering is to be in accordance with the requirements as defined in table 3-2-18.

Items		Standard range	Allowable limits	Remarks
Liner (including various liner of bearing seat)	Linear	Taper of contact surface between tapered liners $\leq 1:50$		
	Cast iron	≥ 25	—	There is one group are not to be more than 2 pieces
	Steel	≥ 15		As per manufacturer's specification
	Epoxy resin	—		
Fit of roller diameter	Hide roller diameter	18~30 mm		
	Roller diameter	$>50 \sim 120$ mm		
Installation	Interference	0.005		
	Clearance	0.014		
		Interference	0.005	
		Clearance	0.002	
		Interference	0.014	
		Clearance	0.005	

Table 3-3-1 (continued)

mm

Items		Standard range	Allowable limits	Remarks
Liner (including various liner of bearing seat)	Contact clearance of fixed liner bore	≤ 0.10	Not specified	Allowable inserting depth of 0.10 feeler to be not more than 10
	Welding			
	Support liners	Blue oil points (25×25)	$\geq 90\%$	To be evenly colored
	Support liners	Blue oil points (25×25)	$\geq 90\%$	Allowable inserting depth of 0.05 feeler to be not more than 10
Tapered wedge	Clearance	≤ 0.05		Allowable inserting depth of 0.05 feeler to be not more than 10
	Contact ratio	$\geq 70\%$	$\geq 90\%$	
Tapered wedge	Blue oil points (25×25)	$\geq 90\%$		
	Clearance	≤ 0.05		Allowable inserting depth of 0.05 feeler to be not more than 10

Table 3-3-1 (continued)

mm

Table 3-3-1 (continued)

Items		Standard range	Allowable limits	Remarks
Installation	Clearance between bolt head and foundation and clearance between nut and inner cotton pole after fastening	<0.05	—	0.05 factor is unable to be inserted
	Correction of output shaft flange of main engine with large flange of intermediate shaft	Offset ≤ 0.10 Deflection $\leq 0.10 \times 10^{-3}$	—	D is outside diameter of measured flange

mm

Table 3-3-1 (end)

mm

Items		Standard range	Allowable limits	Remarks
Installation	Crank web deflection	—	—	In accordance with technical specifications of manufacturer
	Web deflection when moment balances are fixed at fore and aft ends or heavy fly-wheel is fixed at aft end	$<0.15 \times \frac{S}{1000}$	Not specified	S is stroke of piston d is diameter of main journal
	Distance from the measured position to the centerline of crank pin	—	$\frac{(S+d)}{2}$	

3.2 Shafting

Installation of shafting and boring of stern tube frame and shaft bracket are to be in accordance with the requirements as defined in table 3-3-2.

Table 3-3-2

Items	Standard range	Allowable limits	Remarks	Centering of shafting			
				Shafting centerline		Deviation of shafting	
Long shafting (>15m)	Left or right	±7	—	Deadweight exceeding 100,000 tonnes	Deviation of shafting centreline from rudder centreline	Deadweight not exceeding 100,000 tonnes	Hole of stern tube frame and holes of shaft brackets
	Above or below	±10	—				
	Left or right	±3	—	Short shafting (≤15m)	Deviation of bored centre from calculated centre	≤0.10	Surface roughness R_a of bored circle
	Above or below	L7	—				
				≤8	≤6	≤4	0.0063
				≤5	≤4	≤5	0.0125

Table 3-3-2(continued)

Items		Standard range	Allowable limits	Remarks	
Bore	Requirements of circularity and cylindricality of boring	Centering of shafting	≤120	≤0.025	—
			>120~180	≤0.020	—
			>180~260	≤0.020	
			>260~360	≤0.030	—
			>360~500	≤0.035	
			>500~700	≤0.040	—
			>700~900	≤0.050	

mm

Items			Installation	
Standard range	Allowable limits	Remarks	Matching of propeller with cone part of tail shaft	Blue oil paints (25 × 25)
Standard range	Allowable limits	Remarks	Contact ratio	Key connection
Standard range	Allowable limits	Remarks	Keyless connection	Not specified

Table 3-3-2 (end)

mm

Items			Installation	
Standard range	Allowable limits	Remarks	Deviation of actual load on bearing from calculated value	Alignment of shafting
Standard range	Allowable limits	Remarks	Distortion	Correct
Standard range	Allowable limits	Remarks	Not specified	Not specified
Standard range	Allowable limits	Remarks	Not specified	Not specified

Table 3-3-2(continued)

mm

3.3 Auxiliary machinery

Installation of auxiliary machinery and fasteners is to be in accordance with the requirements as defined in table 3-3-3.

Table 3-3-3

Category of auxiliary machinery	Items	Standard range	Allowable limits	Remarks
First class	Diesel generator set, steam turbine generator set, steam turbine machinery	—	—	—
	Fresh water pump, fresh water cooling pump, bilge pump, main engine set, water cooling pump, fire pump, fuel oil transfer pump, ballast pump, bilge and general service pump, emergency diesel generator set, air compressor, cargo oil pump, oil separator, hydraulic pump	—	—	The bilge pump may be listed in third class category if it is fixed on the common base
Second class	—	—	—	—

Table 3-3-3 (continued)

Category of auxiliary machinery	Items	Standard range	Allowable limits	Remarks
Third class	Auxiliary machinery other than those of first class and second class	—	—	—
	Leanness of end frame face plate	≤ 2	≤ 5	Local, dispersed and small amount deviation from the limit is allowed
Installation	Clearance between liner and foundation	First class	≤ 0.05	Allowable inserting depth of 0.05 feeler not more than 10
		Second class	≤ 0.08	—
		Third class	Not specified	—

Diesel generating set	Crank web deflection		Hot condition	—	—	In accordance with technical specifications of manufacturer
			Cold condition	—	—	
Alignment	Flexible connection	Deflection		$\leq 0.30 \times \frac{D}{1000}$	$\leq 0.32 \times \frac{D}{1000}$	D is flange diameter
		Offset		≤ 0.10	≤ 0.12	
	Rigid connection	Power $P > 37 \text{ kW}$	Deflection	$\leq 0.16 \times \frac{D}{1000}$	$\leq 0.23 \times \frac{D}{1000}$	
			Deviation	≤ 0.05	≤ 0.10	
		Power $P \leq 37 \text{ kW}$	Deflection	$\leq 0.10 \times \frac{D}{1000}$	$\leq 0.12 \times \frac{D}{1000}$	
			Deviation	≤ 0.05	≤ 0.07	
	Items		Standard range	Allowable limits	Remarks	

Table 3-3-3 (end)

mm

Items	Installation			Remarks
	Contact area between liners	Third class	Not specified	
First class	Second class	Third class	Outward lap of liner face	Thickness of liner
≥ 60%	≥ 50%	≥ 12	1 ± 100	—
≥ 50%	≥ 40%	—	—	—

Table 3-3-3 (continued)

mm

Items	Installation			Remarks		
	Clearance between liner and bad frame	Contact ratio between liners	Number of fastening and locking nuts	Standard range	Allowable limits	Remarks
Class A	Class A	Class A	Class A	≤ 0.06	≤ 0.10	Allowable insetting depth or incolor is not more than 10
	Class B	Class B	Class B	≤ 0.10	≤ 0.30	
	Class C	Class C	Class C	Not specified	Not specified	
Class A	Class A	Class A	Class A	$\geq 90\%$	$\geq 50\%$	Remarks
	Class B	Class B	Class B	$\geq 50\%$	$\geq 40\%$	
	Class C	Class C	Class C	Not specified	Not specified	
Class A	Class A	Class A	Class A	2 pieces	—	Remarks
	Class B	Class B	Class B	2 pieces	—	
	Class C	Class C	Class C	Not specified	—	

Table 3-3-4 (end)

mm

Items	Category of deck machinery			Liner			Remarks
	A	B	C	Outward taper	Surface roughness R_a	Thickness	
Standard range	Winch, winchless, anchor, capstan	Machining winch, cargo winch	Machinery other than those of class A and class B	1 : 100	0.005 3	Class A, B	Allowable limits
				1 : 50	0.012 5	Class C liner (steel, copper sheet)	
						2 sheets	
Allowable limits						3 sheets	Remarks
						not liner is not allowed	

Table 3-3-4

mm

3.4 Deck machinery

Installation of deck machinery and manufacture of fastening fittings is to be in accordance with the requirements as defined in table 3-3-4.

3-6 Fabrication and installation of piping

3-6.1 Fabrication of piping is to be in accordance with the requirements as defined in table 3-3-6.

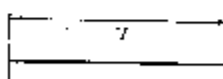
Items			Standard range		Allowable limits	Remarks
Length error of straight pipe			ΔL		± 3	
			ΔL_1		± 3	
			ΔL_2		± 6	
			ΔL_3		± 6	
Length error of bent pipe			$\Delta \theta$	$\pm 0.3^\circ$	$\pm 1.0^\circ$	

Table 3-3-6

mm

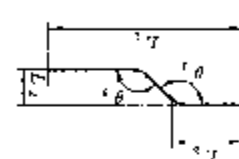
Items			Standard range		Allowable limits	Remarks
Length error of two directional bent pipe			ΔL_1	± 3	± 6	
Length error of three directional bent pipe			ΔL_2	± 3	± 6	
			ΔL_3	± 3	± 6	
			$ \theta_1, \theta_2 $	1°	2°	
			ΔL_1	± 3	± 6	
			ΔL_2	± 3	± 6	
			ΔL_3	± 3	± 6	
			$\Delta \theta$	$\pm 0.3^\circ$	$\pm 1.0^\circ$	

Table 3-3-6 (continued)

mm

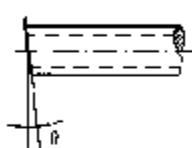
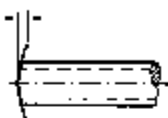
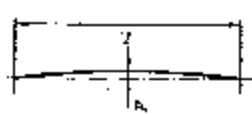
Items				Remarks
Angular error of flange flange to end of pipe, θ				
	$L_N < 150$	$D_N \geq 150$	20'	Not specified
	$L_N \geq 150$		30'	
Standard range				Allowable limits
Standard range				
	$D_N < 200$	$L_N \geq 200$	≤ 1.0	Not specified
	$L_N \geq 200$	~ 450	≤ 2.0	
	$L_N \geq 450$		≤ 2.5	
Deflection of pipe, Δ				Not specified
	$D_N \geq 40$	$\leq \frac{1.5}{1000} L$		

Table 3-3-6 (end)

mm

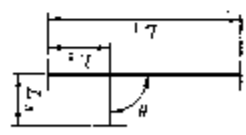
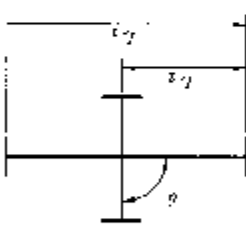
Items				Remarks
 Length error of branch pipe	ΔL_1	± 3	± 3	 Length error of cross piece
	ΔL_2	± 3	± 3	
	ΔL_3	± 3	± 3	
	$\Delta \theta$	$\pm 0.5'$	$\pm 0.5'$	
Standard range				Allowable limits
				Remarks

Table 3-3-6 (continued)

mm

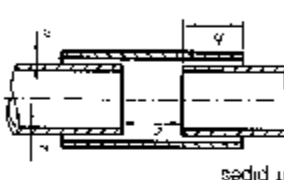
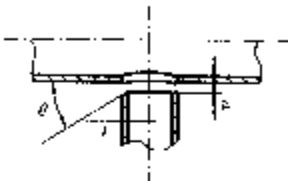
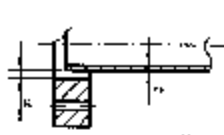
Remarks		Allowable limits	Standard range		Items			
t is pipe wall thickness	 Sleeve joint of pipes	 Branch pipe	 Flange welding	a	b	c	d	
				e	f	g	h	
				i	j	k	l	
				m	n	o	p	
				q	r	s	t	
				u	v	w	x	
Not specified		≤ 2.0	≤ 1.1	$\geq 3t$	$\geq 4t$	≤ 2	≤ 3	
Not specified		≤ 2.0	≤ 1.1	$\geq 3t$	$\geq 4t$	≤ 2	≤ 3	
Not specified		≤ 2.0	≤ 1.1	$\geq 3t$	$\geq 4t$	≤ 2	≤ 3	
Not specified		≤ 2.0	≤ 1.1	$\geq 3t$	$\geq 4t$	≤ 2	≤ 3	
Not specified		≤ 2.0	≤ 1.1	$\geq 3t$	$\geq 4t$	≤ 2	≤ 3	
Not specified		≤ 2.0	≤ 1.1	$\geq 3t$	$\geq 4t$	≤ 2	≤ 3	

Table 3-3-7 (continued)

mm

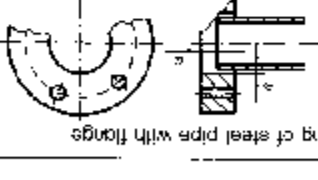
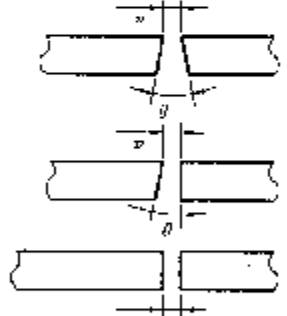
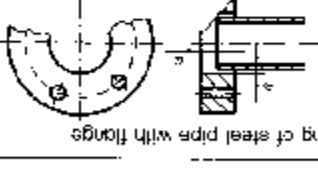
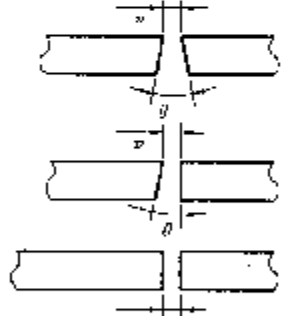
Items		Standard range		Allowable limits		Remarks	
 Lap welding of steel pipe with flange  Grooves for butt welding of steel pipes	 Lap welding of steel pipe with flange  Grooves for butt welding of steel pipes	α	β	$t \leq 3$	α	≤ 1	t is pipe wall thickness
					α	< 3	
					θ	$> 3.0''$	
					α	$2 \sim 2.5$	
					$t > 8$	θ	
					$t > 8$	θ	

Table 3-3-7

mm

3.6.2 Pipe connection is to be made in accordance with the requirements as defined in table 3-3-7.

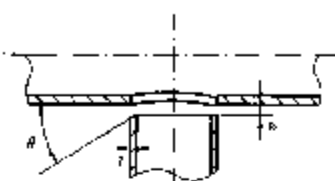
Items		Standard range		Allowable limits	Remarks
 Branch soldering		≤ 1		a	t is pipe wall thickness
		$3 < t < 6$		a	
		$> 40^\circ$		≤ 1.5	≤ 3.0
		$\leq 40^\circ$		≤ 2.0	

Table 3-3-7 (end)

mm

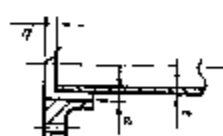
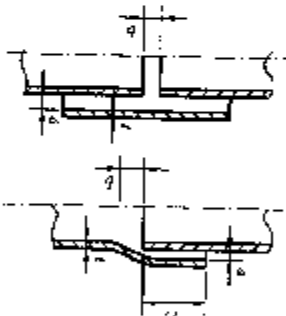
Items		Standard range		Allowable limits	Remarks
 Flange soldering		≤ 0.2		a	t is pipe wall thickness
		≤ 1.0		b	
 Soldering or sleeve joint		≤ 0.2		a	
		≤ 1.0		b	
		$\geq 5t$		I	Not specified
		≤ 1.0		b	Not specified

Table 3-3-7 (continued)

mm

Items				Allowable limits	Remarks
The s actual outside diameter of pipe, mm	Aluminum brass pipe	$R \leq 27\%$	Cold bending	15	
		$27\% < R \leq 37\%$	Cold bending	10	
		$37\% < R \leq 47\%$	Cold bending	10	
		$R > 47\%$	Cold bending	8	

Table 3-3-8 (continued)

%

Items				Allowable limits	Remarks
Slability ratio $\frac{R}{100 \cdot K}$ Where: $R = \frac{P_s}{P_c} \times 100$ P_s is maximum outside diameter of bending section, mm P_c is minimum outside diameter of bending section, mm of bending section, mm	Steel and copper pipes	$R \leq 27\%$	Cold bending	10	R is bending radius
		$27\% < R \leq 37\%$	Cold bending	10	
		$37\% < R \leq 47\%$	Cold bending	10	
		$R > 47\%$	Cold bending	10	
			Hot bending	8	
			Hot bending	8	
			Hot bending	5	
			Hot bending	5	

Table 3-3-8

%

3-3-3 Bending of pipe is to be in accordance with the requirements as defined in table 3-3-8.

Items				Standard range	Allowable limits	Remarks
Well thickness reduction ratio, F	Cooper pipe	$R \leq 2D_w$	Cold bending	—	20	
			Hot bending	—	10	
		$2D_w < R \leq 3D_w$	Cold bending	—	25	
			Hot bending	—	10	
		$3D_w < R \leq 4D_w$	Cold bending	—	25	
			Hot bending	—	10	
		$R > 4D_w$	Cold bending	—	30	
			Hot bending	—	15	

Table 3-3-8 (continued)

%

Items				Standard range	Allowable limits	Remarks
Steel pipe	Where: reduction ratio, F $F = \frac{t - t_0}{t} \times 100$ t is pipe wall in total thickness, mm t_0 is wall thickness after bending, mm	$R \leq 2D_w$	Cold bending	—	20	
			Hot bending	—	10	
		$2D_w < R \leq 3D_w$	Cold bending	—	25	
			Hot bending	—	10	
		$3D_w < R \leq 4D_w$	Cold bending	—	20	
			Hot bending	—	5	
		$R > 4D_w$	Cold bending	—	15	
			Hot bending	—	5	

Table 3-3-8 (continued)

%

313

313

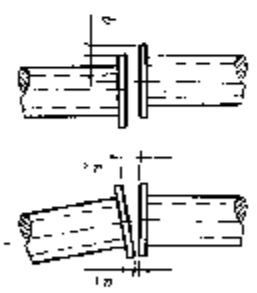

mm		Table 3-3-9 (continued)				
Terms		Standard range		Allowable limits		Remarks
Alignment		$R \leq 100$	≤ 1.5			
		$100 < R \leq 200$	≤ 2.0			
		$200 < R \leq 400$	≤ 3.0			
		$R > 400$	≤ 4.0			
		Offset, b	≤ 1.5			
Offset of range bolt hole, mm			< 1			
						

Table 3-3-9 (continued)

mm

412

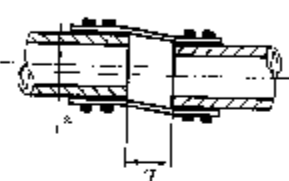
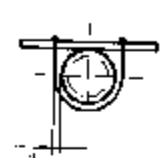
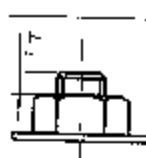
Terms		Table 3-3-9 (continued)				
Alignment of clamped pipes						
Pipe clamp and fastening						
						
Offset or pipe centre, a		< 3	Standard range		Allowable limits	Remarks
Clearance between pipe units, L		< 10	Not specified			
Clearance of U-shape pipe clamp or flat steel pipe clamp, a		1 ~ 3	Not specified			
Length of extension of nut thread after fastening, L ₁		(1 ~ 4) × pitch				

Table 3-3-9 (continued)

mm

415

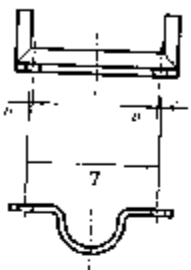
Items				Remarks
Distance between brackets				
	Offset of hole centre on bracket with flat steel strip pipe clamp, ΔL	$c \sim 2$	Not specified	
	Offset of hole centre on bracket, ΔL	± 2	Not specified	

Table 3-3-9 (end)

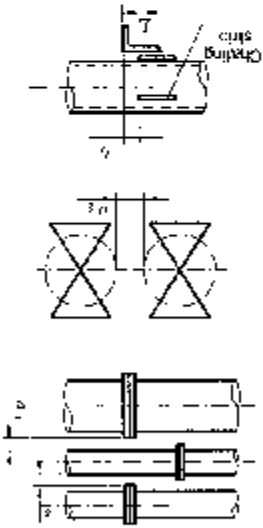
Items				Remarks
Distance between pipes and pipe fittings				
	Distance between parallel pipes (including fittings), a	≥ 20	> 10	
	Distance between outside surfaces of insulated pipe and adjacent pipe fittings, a_1	> 50	Not specified	
	Distance between adjacent control valves and handwheel, a_2	≥ 30	Not specified	
	Assembling offset of pipe drill division on a tray bracket, L	$\leq \frac{1}{3} L$	Not specified	

Table 3-3-9 (continued)

Items	Standard range	Allowable limits	Remarks
Number of layers	2 layers in general (or thickness ≤ 50)	—	—
Breadth	≤ 200	—	—
Distance to heat source	≥ 100	No limit if effective means are adopted	—
Distance to most bulkhead	≥ 20	—	—
Distance to fire-resisting bulkhead and dock	≥ 20	—	To thermal insulation

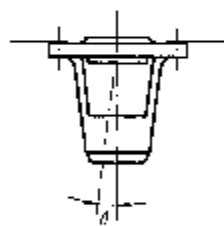
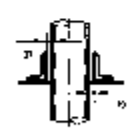
mm

Table 3-4-1

Cable laying is to be carried out in accordance with the requirements as defined in Table 3-4-1.

4.1 Cable laying

4 ELECTRIC INSTALLATION

Items	Clearance between extension rod (operating rod) and bearing α		$D \geq 35$	$0.5 \sim 2.0$	—	
	$D \geq 25 \sim 35$	$0.5 \sim 1.5$	—			
Standard range	Allowable limits	Remarks	F is diameter of extension rod			

mm

Table 3-3-10

3.6.5 Mounting pipe extension rod is to be in accordance with the requirements as defined in Table 3-3-10.

Items	Standard range	Allowable limits	Remarks
Distance to double bottom and location at tank and fuel oil tank	≥50		
Distance of cable trunk to bulkhead and deck	≥30		
Splicing between fixing brackets	<div>Curved space</div> <div>Straight space</div>	<div>≤250</div> <div>≤1000</div>	
Percentage of cable and through pipe and trunk	≤60%		
Minimum inner radius of bend	<div>$r \leq 25$: thermoplastic material and elastic material insulated metallic</div> <div>severe, unheated, braided and bare</div> <div>metallic sheathed cable</div>	4D	<div>D is cable outside diameter</div>
Length of cable core entering equipment	<div>Others</div> <div>Lighting fixture</div> <div>Switch, receptacle, connecting box, alarm bell, etc.</div>	<div>60</div> <div>≥50</div> <div>120</div>	

4.2 Electric equipment installation

4.2.7 Electric equipment inside the accommodation spaces are to be installed according to the height requirements as defined in table 3-4-2.

7-7-3 01001

Remarks	Items	Standard range limits	Allowable limits	From center to floor	From center to floor
	Concealed switch in cabin and passage	1 300 ~ 1 500	—	From center to desk top	From center to floor
	Waterlight switch in cabin and lavatory passage	1 300 ~ 1 500			
	Waterlight receptacle receptacle with switch	1 500			
	Receptacle for desk lamp, telephone set, radio and TV	150	—	From center to desk top	From center to floor
	Receptacle for wall fan	1 500			
	Concealed receptacle at foot height	300			
	High and low voltage receptacles	1 300	—		

Items	Standard range	Allowable limits	Remarks
Distribution panel, starter and control box	1 800	—	From upper side to floor (not 2 m from lower side to floor)
Push button box	1 400	—	From center to floor
Emergency push button box	1 400	—	From center to floor, and 250 in between when installed upper and down
Switch, switch with receptacle	1 400	—	From center to the deck groove
External passage lamp	150~200	—	From center to the deck groove
Wall-mounted telephone	1 400	—	From center to floor
TV antenna converter	250	—	To TV, measured from TV chassis (fixed below TV)
TV jack	1 500	—	To floor (fixed side IV)
	150	—	To TV chassis

Table 3-4-3

4.2.2 Electric equipment installed in places outside accommodation spaces are to be in compliance with the weight requirements as defined in table 3-4-3.

Items	Standard range	Allowable limits	Remarks
Berth lamp	750	—	From center to head plate
On side wall 300 to 400 from head of berth Middle over head side			
Wall lamp	1 700	—	From lower edge to floor or from railing to 200 above upper edge
Mirror lamp	30 ~ 100		Above mirror
Wall fan	1 800	—	From center to floor
Ceiling fan	1 000	—	From lowest point of rotation to floor
Fire alarm call point	1 400	—	From center to floor
Wall-mounted telephone	1 400	—	From center to floor
Loud-speaker (with potential motor) jack	1 800	—	From center to floor

Table 3-4-2 (end)

mm

5 PAINTING

5.1 Pretreatment of steel surface

5.1.1 Pretreatment of steel surface is to be performed in accordance with the requirements as defined in table 3-5-1.

Table 3-5-1

Items		Standard range		Allowable limits	Remarks
Shot blasting	Steel plate of 4.76 mm	Cleanliness	So 2.5 class		
		Roughness	Medium class		
	Steel sections of 4.76 mm	Cleanliness	So 2.5 class	So 2 class	
		Roughness	Medium class		GB/T 13288
Pickling	Steel plate of 4.76 mm	Cleanliness	No scale No rust No grease No dirt	—	
	Steel sections of 4.76 mm				

Table 3-5-1 (end)

Items		Standard range		Allowable limits	Remarks
Abrasive blasting	Steel plate of any size	Cleanliness	So 2.5 class	—	
	Steel sections of any size	Roughness	Medium class	—	GB/T 13288
		Cleanliness	So 2.5 class		
	Steel outtings	Roughness	Medium class	So 2 class	
					GB/T 13288

Items		Paints		Surface treatment		Standard range		Allowable limits		Remarks																												
Snap primer damaged area, such as weld area and exterior exposed area and seal mulling area and naturally exposed area	Painting location	Shell plating and exterior	Epoxy resin paint, vinyl resin paint, polyurethane paint	Epoxy-tar point	Abrasive blasting	Sa 2.5 class	St 3 class	Sa 3 class	Sa 2.5 class	Sa 2 class	---																											
												Conventional paints ¹⁾	Abrasive blasting	Sa 2 class	---																							
																chlorinated rubber paint	Power tool	St 2 ~ 3 class	---																			
																				inorganic zinc paint	Abrasive blasting	Sa 2.5 class	---															
																								Power tool	St 3 class	---												
																											Power tool	St 3 class	---									
																														Power tool	St 3 class	---						
																																	Power tool	St 3 class	---			
																																				Power tool	St 3 class	---

Table 3-5-3

5.2 Secondary derusting Cleanliness after secondary derusting is to be in compliance with the requirements as defined in table 3-5-3.

Items	Standard range		Allowable limits	Remarks
Type of paint	Zinc primer	..		Approved by classification society in accordance with painting scheme approved by shipowner
	Zinc-rich primer			
Film thickness	Zinc primer	13 ~ 18	≥ 12 ≤ 30	
	Thickness primer	20 ~ 25	≥ 18 ≤ 40	

Table 3-5-2

5.1.2 Application of shop primer is to be in accordance with the requirements as defined in table 3-5-2.

Items		Position	Paint type	Surface treatment	Standard range	Allowable limits	Remarks
Stop primer damaged area, such as weld area, line and spot heating area and naturally exposed area	Interior of liquid tank (excluding rust point), epoxy resin, polyurethane, polyurethane, epoxy-tar point	Conventional paint	Abrasive blasting	Sa 2 class	St 2 ~ 3 class	—	
Stop primer damaged area, such as weld area, line and spot heating area and naturally exposed area	Interior of liquid tank (excluding rust point), epoxy resin, polyurethane, polyurethane, epoxy-tar point	Conventional paint	Abrasive blasting	Sa 2 class	St 2 ~ 3 class	—	
Stop primer damaged area, such as weld area, line and spot heating area and naturally exposed area	Interior of liquid tank (excluding rust point), epoxy resin, polyurethane, polyurethane, epoxy-tar point	Conventional paint	Abrasive blasting	Sa 2 class	St 2 ~ 3 class	—	
Stop primer damaged area, such as weld area, line and spot heating area and naturally exposed area	Interior of liquid tank (excluding rust point), epoxy resin, polyurethane, polyurethane, epoxy-tar point	Conventional paint	Abrasive blasting	Sa 2 class	St 2 ~ 3 class	—	

Table 3-5-3 (continued)

Items		Position	Paint type	Surface treatment	Standard range	Allowable limits	Remarks
Stop primer damaged area, such as weld area, line and spot heating area and naturally exposed area	Interior of liquid tank (excluding rust point), epoxy resin, polyurethane, polyurethane, epoxy-tar point	Conventional paint	Abrasive blasting	Sa 2 class	St 2 ~ 3 class	—	
Stop primer damaged area, such as weld area, line and spot heating area and naturally exposed area	Interior of liquid tank (excluding rust point), epoxy resin, polyurethane, polyurethane, epoxy-tar point	Conventional paint	Abrasive blasting	Sa 2 class	St 2 ~ 3 class	—	
Stop primer damaged area, such as weld area, line and spot heating area and naturally exposed area	Interior of liquid tank (excluding rust point), epoxy resin, polyurethane, polyurethane, epoxy-tar point	Conventional paint	Abrasive blasting	Sa 2 class	St 2 ~ 3 class	—	

Table 3-5-3 (continued)

Items	Before applying any paint	Remove	With trace remained	Remarks
Moisture	Before applying any paint	invisible to naked eye	—	
	Before applying any paint	invisible to naked eye	—	
Salt	Before applying any paint	invisible to naked eye	—	
	Before applying any paint	invisible to naked eye	—	
Grease	Before applying any paint	invisible to naked eye	—	
	Before applying any paint	invisible to naked eye	—	
Dust	Before applying any paint	invisible to naked eye	—	
	Before applying any paint	invisible to naked eye	—	

Table 3-5-4

3-5-4.

5.3 Surface cleaning before painting is to be performed in accordance with the requirements as defined in table 3-5-4.

Note: 1) Conventional paints include oil-based paint, oil-modified synthetic resin based paint and bituminous paint. For oil tank and lubrication oil tank, conventional paints imply those temporary protective paints based on petroleum resin and ester oil and conventionally used shop primer. In case chemical paint is used for oil tank, the quality control requirements are to be the same as those for the application of epoxy resin paint.

Items	Position	Point type	Surface treatment	Standard range	Allowable limits	Remarks
Surface with intact shop primer	Product: tanker, oil tanker, except cargo tank	Any point	Abrasive blasting + Power tool	Remove rust, grease and dirt	—	
	Interior of cargo tank of product tanker	Base of cargo tank for product tanker	Abrasive blasting	Remove over 70% of previously applied primer	—	

Table 3-5-3 (end)

Items		Standard range	Allowable limits	Remarks
Paint marking	Before applying inorganic zinc paint	Remove	With slight trace remained	
	Before applying chlorinated rubber paint, epoxy resin paint, vinyl resin paint and polyurethane resin paint	In case the marking point is compatible No need to remove		
	In case the marking point is not compatible	Remove	With trace remained	
	Before applying conventional paint	No need to remove		

Table 3-5-4 (end)

Items		Standard range	Allowable limits	Remarks
Zincate scale	Before applying inorganic paint	Remove	With slight trace remained	
	Before applying paint other than inorganic zinc paint	Remove	With trace remained	
	Dust of gas cutting and welding	Remove	With slight trace remained	
	Before applying zinc paint	Remove	With trace remained	
Check marking	Before applying chlorinated rubber paint, epoxy resin paint, vinyl resin paint and polyurethane resin paint	Remove	With trace remained	
	Before applying inorganic zinc paint	Remove	With slight trace remained	
	Before applying paint other than inorganic zinc paint	Remove	With trace remained	
	Before applying conventional paint	Usually cleared		

Table 3-5-4 (continued)

5.4 Quality of coating

The quality of the coatings to be in compliance with the requirements as defined in table 3-5-5.

Table 3-5-5

Items	Standard range	Allowable limits	Remarks				
				Surface with high decoration restraint (exterior surface of superstructure, exposed surface of wheelhouse, accommodation cabins and interior passage)	Surface with plain decoration restraint (shell coating, exposed deck, engine room and stores)	Defect	Color
Miss-out painting, bubble cavity, crackle, dry particles of paint	None	Not obvious	Slight	In conformity with requirement	None	Miss-out painting, bubble cavity, crackle	Flowtrace, ripple
Flowtrace, ripple	Not obvious	Slight	Not obvious	Not obvious different from requirement	Slight	Flowtrace, ripple	Color

Table 3-5-5 (end)

Items	Standard range	Allowable limits	Remarks
Surface without decoration demand (such as cargo hold, cargo tank, void space and cofferdam etc.)	Miss-out painting, bubble cavity, crackle	None	Not serious
	Flowtrace, ripple	Not obvious	

5.5 Film thickness of coating

Film thickness of coating is to be in compliance with the painting specification. The deviation of the thickness of the film is to be in compliance with the requirements as defined in table 3-5-6.

Table 3-5-6

Items	Distribution of film thickness		Standard range	Allowable limits	Remarks
	Film thickness of over 85% measured points	Film thickness of remaining measured points			
	Up to required thickness	Up to 85% required thickness			
	—	—			For cargo tank of product tanker, the film thickness measured points as to be up to the required film thickness, with film thickness of remaining measured points to be up to 90% required thickness