



					27000DWT 双舷侧散货船 27000DWT DOUBLE SIDE SKIN BULK CARRIER	TECHNICAL DESIGN			
						JR490A-020-02SM			
						SIGN	WEIGHT	SCALE	
SIGN	NUM.	DESCRIPTION	SIG.	DATA	SPECIFICATION OF HULL PART				
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VERIFIED									
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## I- General part

### 1. General

#### 1.1 General provisions

It is to be the intent of this specification and accompanying plans to describe and define the material and works to construct and deliver a bulk carrier. The vessel's navigation area to be unrestricted. The general arrangement plan and this specification should be intended to complement and illustrate each other. If any inconsistency to be found between the Specification and plan, the former shall prevail and govern unless otherwise agreed.

This specification especially stated that the structure and outfitting of the ship to be in accordance with the standards of Classification Society and Shipyard, apply sophisticated method, and to be subject to negotiation between Owner and Builder. In order to realize it, some qualified materials, equipments, and machineries to be adopted, and of the Classification Society's approval.

It should be understood that anything not mentioned in this Specification but required by the Classification Society or Regulatory Bodies listed herein to be supplied and equipped by the builder.

Metric system to be adopted for all documents and finished plans. All meters should use metric system.

One loading computer to be provided.

#### 1.2 General outline

The vessel to be designed to single-deck, single-screw double side skin bulk carrier driven by diesel engine.

The vessel to be designed to have bulbous bow, raked stem, transom stern and a hanging semi-balanced rudder.

The vessel has forecastle, poop, Engine rooms, living room and wheelhouse to be arranged at the aft part of the vessel.

The vessel mainly to be used to transport steel, corn, coal, ore and so on.

The vessel to have seven sets of watertight bulkheads. The vessel to be divided into four cargo holds, fore peak tank and aft peak tank, engine room.

**The cargo area has double skin, double bottom, topside tanks and hopper tanks, part of the topside tanks are used as fuel oil tanks. This ship is comply with the requirements of MARPOL for the protection of fuel oil tanks.**

Double-bottom to be set in engine room area, and used as diesel tank, M/E lube oil circulation tank, fuel oil overflow tank, sludge tank, void tank, bilge water tank, slop tank, bilge well, etc. Inner bottom plate to be horizontally extended to the sides.

The engine room to have escape trunk, up to upper deck. Platform in the engine room to have all kinds of daily oil tank etc.

Fore peak tank to be used as ballast tank.

Aft peak tank to be ballast tank.

The vessel and its material, workmanship, equipment (machinery equipment, pipes, etc.) to be approved by the owner and Class. The vessel to be built according to the Class and international rules and standards, the requirements of drawings, including this Specification approved by owner.

Some other special workmanship standards adopted by the builder to be subject to the approval of Owner.

## **2. Class, Rules, Regulations and Certificates**

### **2.1 Class**

The unrestricted navigation ship to be built under the supervision of CCS Classification Society's surveyor.

Class: CCS

Class Notation:

★CSA, Bulk Carrier, Double Side Skin, Ice Class B, CSR BC-B,

No MP, Grabe-20, CCSS, CCSF, ESP, Loading Computer

(S, I, G)

★CSM, AUTO-0, FTP

### **2.2 Conventions, Regulations and Rules**

The vessel is to comply with following conventions, regulations, and rules, including all amendments issued and in force at the date of signing the Contract.

- (1) International Convention for the Safety of Life at Sea, 1974, and its Amendments (including IMO Resolution 749(18) requirements for intact stability of cargo ship);
- (2) International Convention on Load Lines, 1966, including its Amendments, and Protocol of 1988;
- (3) International Convention for the Prevention of Pollution from Ships, 1973, and its Amendments;
- (4) International Regulations for Preventing Collisions at sea, 1972, and its Amendments.
- (5) International Convention of Tonnage Measurement of Ship 1969 and its Amendments.
- (6) Technical regulations for the statutory survey of sea-going in engaged on international voyages and its Amendments. (in force)
- (7) Rules and regulations for the classification of sea-going steel ships and its Amendments of CCS.(in force)
- (8) Guidelines for hull structure of double side skin bulk carriers.(CCS)

- (9) Guidelines for direct strength analysis of double side skin bulk carriers.(CCS)
- (10) Guidelines for structure fatigue strength of double side skin bulk carriers.(CCS)
- (11) Rules for materials and welding and its Amendments. (in force)
- (12) Sight Area of Wheelhouse on Board Ships, IMO Resolution A708(17), 1992.
- (13) Electric Equipment and Electrical Installation Regulation of International Electro-technical Commission (IEC), No.92.
- (14) Requirement of ILO.
- (15) Panama Canal Regulations.
- (16) Suez Canal Regulations.

### 2.3 Certificate

The Builder shall obtain the following certificates and deliver to the Owner at the time of the vessel's delivery. Each certificate shall be delivered in quadruplicate, one (1) original and three (3) copies.

Negotiation to be asked for about the formal certificate between the Owner and the Builder, if no formal certificate, at delivery of the vessel.

- Certificate of class;
- Builder's Certificate, offered by the Shipyard;
- The followings are Certificate about International Convention for the Safety of Life at Sea ( issued by Classification ) :

① Safety construction certificate;

② Safety equipment certificate;

③ Radio equipment certificate;

④ Navigation equipment certificate;

- International Oil Pollution Prevention Certificate;
- Certificate of load line for vessel of international voyage;
- Anchor, Chain and Mooring rope Test Certificate;
- Lifting Gear Certificate;
- Register Tonnage Certificate;
- Certificate of deadweight;
- Lifesaving equipment certificate;
- Signal light equipment certificate;
- Drinking water certificate;
- Certificate of flag;
- Some other useful Certificate, as: Product Certificate, Product Quality

Certificate of Builder; Light, Compass, and Foghorn Certificates issued by Classification Society; Compass adjustment Certificate issued by Builder. Riggings and Crane of the ship to have Product Certificate.

## 2.4 Flag

China.

## 3. Main particulars

### 3.1 Main dimensions

Length over all	Loa	169.37m
Length between perpendicular	Lpp	159.8m
Breadth (molded)	B	25.0m
Depth (molded)	D	14.3m
Design draft	d	10.2m

### 3.2 Deadweight

Deadweight (general cargo) 27000T

The definition of the deadweight to be referred to I-6.2.

### 3.3 Tank capacity

Cargo hold	35736 m <sup>3</sup>
Fuel oil tank	981 m <sup>3</sup>
Diesel oil tank	165 m <sup>3</sup>
Fresh water tank	385 m <sup>3</sup>
Ballast tank	10435 m <sup>3</sup>
Lubrication oil tank	70 m <sup>3</sup>

### 3.4 Speed and Endurance

The Service speed at 10.2m design draft to be about 13.1 knots with the main engine under CSR of 90% MCR, and wind to be less than Beaufort wind scale 3-grade.

The endurance to be about 10000 n mile, with the consumption rate of fuel oil and the capacity of fuel oil tank, and service speed abovementioned.

### 3.5 Engine and Auxiliary

Main engine: One set of B & W6S35ME-B.

SMCR/Rotation speed: 5220kW/167rpm

Propeller:

Propeller design rate: 4698kW/167rpm

Ni-Al-Bronze, integral type, 3 class.

Four blades with a medium skew.

### 3.6 Navigation area

The vessel to be built for unrestricted navigation area.

### 3.7 Hatch covers and Opening way

Four hatch covers to be arranged on the ship, No1 21000×15000, No2 22500×15000, No3 22500×15000, No4 23250×15000.

The opening way of hatch cover to be folding type, to be divided into 16 pieces, each piece to be not exceed 20t.

## 4. Complements

The complement of the vessel to be 24 persons.

Rank	Class	Person	Duty	Person	Duty	Person	Duty	Person
Officer	Captain class	3	Captain	1	C/Engineer	1	Ship owner	1
	Officers	6	C/Officer	1	2/Engineer	1		
			2/Officer	1	3/Engineer	1		
			3/Officer	1	4/Engineer	1		
Sum	9		4		4		1	
Crew	Boatswain class	3	Boatswain	1	C/Mechanist	1	C/Cook	1
	Others	2	Sailor	4	Mechanist	3	Electrician	1
			carpenter	1	2/Cook	1	Apprentice	2
Sum	5							
Total	24							

## 5. Test and trial

### 5.1 General

All tests and trials to be performed in accordance with builders' regimentation, trial scheme, and mooring test scheme approved by ship owner and classification society. Outfittings, machineries and equipments to be surveyed

and approved by ship owner and classification society, and obtain CCS certificate; Imported equipments should be approved by ship owner and classification society.

List of tests and trials is to be worked out by Builder in accordance with relative rules and regulations of classification society, the requirements of international conventions, relative documents and plans and equipment specification. The schemes of Mooring test and navigating test to be submitted to ship-owner representatives and surveyors one month before the test.

All the items of tests, surveys and inspection sequences are to be approved by representatives and surveyors, to be inspected by builder before sending for approval. Remove subsistent defect and then sign qualification report by quality inspection section in one day before submitting written notice and qualification judgments mentioned above to ship owner representatives and surveyors.

In the process of construction and test, if ship owner or other representatives find errors on aspect of material, product and construction, and other things that don't comply with technical documentations in the contract accessories, builder is to modify or change equipments at a proper time.

Ship owner representatives' assigning and authority, builders' duties and responsibilities to comply with items of construction contract.

### **5.2 Workshop test**

Machineries, equipments, fittings and so on for this vessel, to comply with the requirements of classification society, and / or standard test orders of the builder and /or equipment manufacturers. Tests and inspections to be done in the workshops of the builder, or factories of equipment manufacturers before shipment. Necessary data to be recorded and submitted to the ship owner representatives and surveyors.

The range of tests and inspections that Surveyors and Ship-owner representatives must take part in, to be decided jointly by Surveyors, Ship-owner representatives and the Builder according to detailed test procedure made by the builder.

### **5.3 Structure test and on-broad test**

The structure of the vessel is to be inspected and/or tested in accordance with the requirements of classification society. Machineries, equipments and fittings, to be installed on broad and to finish inspection and test of utility in order to guarantee them comply with the requirements of international rules, regulations and correlative plans. All tests should be carried out under the supervision of the shipowner representatives and surveyors.

In the status of anchoring or mooring, main engine's running test is to be completed at builder's quay.

Items, content, program and arrangement of the whole mooring test, are to be approved by the shipowner representatives and surveyors.

#### **5.4 Light weight measuring and inclining test**

Builders can do light weight measurement and inclining test if it has been agreed by shipowner representatives and surveyors when construction has been mostly completed and only few minor components that don't affect results of test are not completed.

##### **5.4.1 Light weight measuring**

Light weight measuring is to be done by the methods of recording this vessel's draft, measuring seawater's density, amending redundant and insufficient weight, in the presence of the surveyors and shipowner representatives.

This vessel's draft is to be measured on the scales at fore, aft and middle on each side.

In the process of light weight measuring, this vessel's displacement is to be measured in accordance with average draft given by calculating drafts measured, and then be read in the hydrostatic curve. Amendment of trim, heeling and vessel's deflection and seawater's density are to be considered during calculation.

In the process of light weight measuring, if there is redundant weight on board or some necessary parts of light weight not to be on board, this weight is to be considered. Light weight are to be calculated by builders, and to be confirmed by ship-owner representatives, surveyors and design section.

##### **5.4.2 Inclining test**

Inclining test can only be done in accordance with the requirements of classification society in the presence of the surveyors and shipowner representatives. The position of center of gravity of light ship is to be calculated on the base of inclining results.

The methods of computation are to be approved by classification society surveyor and owner representative.

The intact stability calculation and loading manual to be based on the results of inclining test report finished by design section and approved by surveyors.

#### **5.5 Trial**

Sea trial can only be done after completing mooring test and inclining test, removing construction defect and acquiring approval from classification society surveyor and owner representative.

Sea trial is to be done in a good enough weather condition.

Sea trial scheme is to be approved by classification society surveyor and owner representative. In the process of sea trial, necessary data is to be recorded, and results are to be submitted to classification society surveyor, owner representative and design section in time.

If some basic errors appear during sea trial, shipyard must solve them and do sea trial again in a proper time.

During sea trial, main machine, auxiliary machine and boiler mainly to use fuel oil or light diesel oil. Do utility test of burning 380CST(50 ° C) fuel oil. If there is trouble in supplying oil, it is to be solved with ship-owner's assistance or to be solved in negotiation between ship owner and builder. Sea trial could be done in ballast status approved by ship owner.

Test items in sea trial to be as follows:

#### 1. Speed test

Speed test is to be performed in the condition of the following main engine load (Test of each load to be of continuous navigation once in forward and reverse directions).

Main engine load: 1/2 selected maximum continuous rating

3/4 selected maximum continuous rating

continuous service rating(CSR)

Selected maximum continuous rated (SMCR) (or 105% rated rotation speed)

Speed to be measured by DGPS.

#### 2. Endurance test

Endurance test is to last for six hours in the condition of CSR main engine load, excluding of run time in the speed test in the condition of CSR mentioned above.

Measure the heavy fuel oil consumption of main engine for reference.

#### 3. Maneuvering test

The following tests are to be done to inspect maneuverability of this vessel.

##### 1) Crash stop astern test

Main engine load: transfer from ahead service rate of rotation to reversal.

##### 2) 360° turning test, rudder angle $\pm 35^\circ$ .

Main engine load: ahead service rate of rotation (less than engine load).

##### 3) Inertia test

Transfer from ahead service rate of rotation to about five-knots speed.

##### 4) Zigzag maneuvering test

Record relevant data of maneuvering test.

#### 4. Other tests at sea

The following tests and measuring to be done at a proper time

##### 1) Steering test

##### 2) Anchoring test (80m depth)

##### 3) Tests for adjusting navigation equipments and instrument, such as electrical compass, speed log and so on.

##### 4) Main engine starting test

##### 5) Test for Main engine's minimum stable rate of rotation.

##### 6) Measure torsion vibration

- 7) Test for using composite boiler.
- 8) Measure noise
- 9) Utility test for air conditioner
- 10) Utility tests for all other equipments
- 11) Other non-mentioned items are to be referred to the scheme of mooring test or sea trial.

Tests above mentioned are to be separated in accordance with characters of respective tests, and to be completed in the harbor or in the period of pre-trial.

#### (5) Overhauling inspection

During (after) sea trial motion parts of main engine and auxiliary machine are to be opened for ship owner and surveyors' inspection according to shipyard's standards approved by ship owner, and then to be reinstall after checking and do offshore run test of finished Strip inspection before delivery.

## **6. Light weight and deadweight**

### **6.1 Light weight**

The light weight to be the weight of the vessel completely ready for service and to consist of the hull, marine machineries and electricity, including all spare parts required by all conventions, regulations, rules and this specification, and to be determined by the method of measuring light weight that is stated in paragraph 5.4 for Measuring light weight.

Light weight to consist of parts as following:

- (1) The weight to consist of the hull, marine machineries and electricity, including the spare parts as required by conventions, rules, regulations and this specification.
- (2) Oil and water in main engine fuel oil system, main engine lubricating oil system, main engine water cooling system, are main engine, auxiliary machinery, heat interchanger, pipeline, valve parts as well as filters and stay on working liquid level respectively. Oil and water in main engine fuel oil system, main engine lubricating oil, main engine water cooling system of generator and auxiliary boiler concerning propelling, are in generator, heat interchanger, boiler, pipeline, valve parts as well as filters and all stay on working liquid level.

### **6.2 Deadweight**

The deadweight is to be determined as the difference between total displacement and lightweight.

The displacement that is total displacement including weight of ship shell and all the appendages in the condition of design draft and in density 1.025 seawater, is to be determined according to relation between draft and displacement when ship is non-trim, non-heeling and non-deflection.

Deadweight to consist of the following weights and cargo weight:

(1) Fuel oil, lubricating oil and water in piping, machinery and tanks (stern pipe cooling water tank), excluding the items that are marked as parts of light weight.

(2) Staffs on board and their baggages.

(3) All the consumptive materials, sundries, sea charts, books, cooks and waiter appliances, cleaning cloth, blankets and bed coverings.

(4) Spare parts on board out of Conventions, Rules, Regulations, and this specification.

If there is any modification of the hull, marine machineries, and electricity out of this specification required by the ship owner, the guaranteed deadweight should be adjusted accordingly.

## **7. Construction procedure**

### **7.1 Work procedure**

Builder to complete all the items stated in this specification according to working program, complying with full sets of technical design plans and documents concerning this vessel from ship owner and this specification as well as its accessory plans, and to prepare construction plans.

Builder supply ship-owner representatives and surveyors with main design and construction schedule after signing contract, meanwhile, these schedule to be carried out in cooperation with ship owner and builder.

### **7.2 Plan**

#### **7.2.1 Literal and unit**

Plans stated below in this specification, are plans to be submitted to the ship owner such as technical design plans, construction design plans, plans for confirmation, finished plan and so on.

Units in plans to be of international legal measuring units (including hydrostatic table of standard performance and deadweight scale).

All kinds of scales on board to be international legal measuring units.

In operating instruction of electromechanical devices also to be of international legal measuring units in principle.

Proper ratios such as 1/200, 1/100, 1/50 and so on, to be used as routine in plans.

Chinese and English to be used in plans and technical documents of this vessel except those with additional instructions.

Finished plans supplied by foreign equipment suppliers and finished documents to use English, documents of stability outputted from computer to use English. Loading manual, ballast management plan, etc. to use Chinese and English correspondently.

#### **7.2.2 construction drawing and equipment approval drawing**

Construction drawing of this vessel to be respectively submitted to ship owner

representatives and ship-owner headquarters for future reference in accordance with list as approved by ship owner.

All the Equipment approval documents of this vessel to be respectively submitted to ship owner representatives and ship-owner headquarters for approval.

### **7.2.3 Finished plan**

Finished plan and documents to be supplied to ship owner by design department before delivery, each of four pieces, its contents list to be affirmed by ship owner at least one month before sailing. Builders to provide the design section with modification items necessary for finishing plans and documents. Plans and technical documents that are necessary for sailing, to be supplied before sailing by the design section.

The following plans and documents to be kept in aluminum frame after plastic laminating packaging:

- (1) General Arrangement Plan
- (2) Capacity Plan with Deadweight Scale
- (3) Ballast System Piping Drawing
- (4) Fire Control Plan

### **7.3 Materials and equipments' choosing**

Builder shall choose materials and equipments in accordance with Conventions, Regulations, Rules, the equipments in this specification and the maker list.

For every equipment in the maker list, builder will choose a manufacturer from those listed in it as maker of this equipment, except for additional decision of ship owner and builder.

If it is difficult to obtain the materials and equipments in accordance with this specification and accompanying plans, builder shall choose other suitable materials and equipments approved by the surveyors and ship owners.

### **7.4 Supervision**

This vessel's construction to be conducted according to work progress schedule under the supervision of surveyors of classification society and ship-owner representatives.

Right and responsibility of ship-owner representatives are to comply with the contract.

During construction of this vessel, ship-owner representative shall be allowed to check the vessel at anytime.

Shipyard to supply a checking schedule noting important events and nodals to the surveyors and shipowner representatives.

Any requirement of crews is to be advanced only through ship-owner representatives.

### **7.5 Docking**

Twelve months after launching, the new vessel should be docked, to remove sewage below waterline and then re-painting for ship hull.

### **7.6 Delivery**

This vessel is to be delivered to the ship owner under the condition of integrity. Unless there is other agreement, delivery time is not to be later than the date required in contract.

After final completion and proved to meet the requirements of this specification through various test, this vessel will be delivered to the ship owner. During the delivery this vessel float safely and be moored firmly, meanwhile all the devices, equipments and systems to be in the status of sea trial and operation. Cover protector should be suitably covered; movable equipments should be suitably bundled; compass has been adjusted; all the rubbish and bilge water should be removed; paint's mending should be finished; outfitting, spares, supplies, storages and so on should be cleaned and piled. All kinds of liquid tanks, deck, accommodation area and other places are to be cleaned. Builder is to supply all the certificates and documents as required in this specification and contract.

### **7.7 Marks and nameplate**

Ship name (Chinese and English), at forward each side and aft, lifeboat, life-raft and lifebuoy.

Port name (Chinese and English), at stern plate.

Draught marks, at each side, one forward, one aft and one amidship.

Freeboard marks(include timber), at amidship, at each side.

Funnel marks, at each side (decided by ship owner)

Ship name plate (Chinese and English), at each side on compass deck.

Cabin nameplate (Chinese and English), on the outside door.

Equipment nameplate (Chinese and English), supplied by the manufacturer.

Warning board(Chinese and English), near the accommodation ladder on poop deck.

Lifeboat and rescue boat operation board(Chinese and English), near the lifeboat and rescue boat.

Pipe nameplate (Chinese and English), decided by ship owner and builder.

Chest, cabinet nameplate (Chinese and English), properly arranged.

Boarding guideline (Chinese and English), near the accommodation ladder on poop deck.

No. of frame marks, each separated 4 frames

Tug push marks, at each side (above water line).

Bulbous bow marks, at each side above bulbous bow (above water line).

Each liquid tank's place marks(Chinese and English), properly arranged in engine room.

Drainage plug marks, on the ship shell.

Each liquid tank's name(Chinese and English), on the manhole cover.

Stern propeller marks, on the ship shell above the stern propeller (above load water line).

All main and auxiliary escape route in the fire control plan should be pasted with IMO marks of self-luminescent material.

### **7.8 Ellipsis**

For the second ship and later sistership of the same ship owner, plans supplied to ship owner, can be elided if not being modified. Meanwhile the following items can also be elided:

- (1) Ship model test
- (2) Inclining test
- (3) Maneuvering test
- (4) Torsional vibration Measurement
- (5) Vibration Measurement
- (6) Noise Measurement

## II Ship Hull

### 1. General

#### 1.1 Hull line form

This vessel's line form will be determined according to ship performance and ship type.

#### 1.2 Deck height and so on

Deck height to be as follows(at center line):

Upper deck to poop deck.....2.8m

Upper deck to forecastle deck.....2.8m

Poop deck to boat deck.....2.7m

Boat deck to crew deck.....2.7m

Crew deck to captain deck.....2.7m

Captain deck to bridge deck.....2.7m

Bridge deck to compass deck .....2.7m

Deck camber:

Upper deck.....0.40m

Forecastle deck and poop deck.....0.30m

Boat deck,bridge deck ,compass deck.....0.15m

Other decks.....0.00m

Frame space

Stern to Fr 10.....600mm

Fr 10 to Fr 206.....750mm

Fr 206 to bow.....600mm

Double bottom height:

Cargo area .....1350mm

Engine area .....1750mm

### **1.3 Freeboard**

The vessel freeboard is to comply with International loadline convention for B type vessel, 1966.

Freeboard mark is to be made from 6mm-thick steel plate and fixed above draught as required by load line marks.

### **1.4 Trim and stability**

The design section is to supply preliminary calculation result of trim and stability to ship owner, to prove that when endurance is 10000 n.m, there are proper trim and stability in all the loading conditions. There shouldn't be bow trim and heel in any loading condition.

Design section is to deliver this vessel's "loading manual" to ship owner with endurance is 10000 n.m.

Load manual, to include bending moment and shear force values in each loading condition. Those values are to be in the range of permission of classification society.

Intact stability:

This vessel's intact stability is to satisfy the IMO749(18) requirements of intact stability for unrestricted navigation area vessel. More details to refer to "Stability Calculation in each loading condition".

Damage stability:

This vessel's damage stability is to comply with SOLAS requirements of 1974 and relevant amendments.

Fuel oil, fresh water, ballast water and cargo oil in damage area are to be substituted by sea water at damage condition(density = 1.025).

Damage stability criterion are as follows:

- 1) Final waterline considered immersion, heel, trim shall be below any opening lower edge.
- 2) On immersion final stage, heeling angle by non-symmetric immersion shall be less than  $25^{\circ}$ , but if deck edge haven't submersion appearance, the angle can be increased to  $30^{\circ}$
- 3) To research the stability in the last period of immersion, if the restoring lever curve at scope outside of the equilibrium to be more than  $20^{\circ}$ , max. remainder restoring lever in  $20^{\circ}$  scope is higher than 0.1m and area of the curve at this scope to be more than 0.0175m-rad, then stability shall be considered enough.

### **1.5 Vibration and noise**

This vessel's structural arrangement, sound isolation and so on shall be designed to reduce vibration and noise, and to be constructed in accordance with IMO A468 (XII), to reduce vibration and noise.

### **1.6 Structure test**

Tests for tightness of hull superstructure and independent small tanks will be done respectively through air tightness test and hose test.

For liquid tank which is a part of main hull and connected with hull, its tests for strength and tightness will be done by seawater as required by classification society. Cargo hold strength test also to be done during sea trial, and affirmed by ship-owner representative and classification society.

For other items such as rudder, small tanks not connected with hull and so on, tightness test will be done in accordance with the requirements of classification society and the practice of builder, and to be approved by surveyors and ship owner representatives.

Weather tight test will be done by jetting water as per builder's practice and as required by classification society.

X-ray inspection for welded joint to be required by classification society.

Surveyors and residential representatives are to decide the positions and quantities according to the requirements of classification society, and to send it to ship owner after classification society's approval. All the nondestructive detection reports are to be handed in to ship-owner residential representatives and surveyor for approval.

### **1.7 Equipment test**

#### **1.7.1 Workshop test**

Workshop tests for main equipments such as windlass, steering gear, winch, ventilator, refrigerator and so on, are to be done according to good practice of manufacturer with the equipments in its workshops.

#### **1.7.2 On-board test**

Food refrigerator chamber's refrigerator will run till required temperature reached. After shutting down for six hours to inspect the performance of insulation.

Steering gear to be manual hard-over angle running tested and adjusting zero position test. (rudder angle to be consistent with rudder indicator)

Windlass test to be divided into no-load run and adjusting setting pressure of system.

Cargo-lifting equipment test to be done in the stage of mooring test, no-load and load tests to be done for cargo crane, and action and load tests to be done for the whole set of device.

Air condition test to be done, but in summer, heating test shall be omitted.

Cooling operation condition test for air conditioner, if there is not proper

surrounding temperature before delivery, to be done after it. Air conditioner is to meet design requirement and have good function.

Tightness test for all the piping to be done after installation, and utility test to be done in working status after inspection test. Static pressure test for piping to be done as per the requirements of classification society.

In order to inspect whether run normally or not, utility test to be performed for items as follows:

Lifeboat davit, weather tight door, accommodation ladder, accommodation ladder winch, mooring winch, lifeboat winch, ventilator and so on.

## **2. Hull construction**

### **2.1 General**

#### **2.1.1 Material and component scantling**

All materials of hull structure to be marine low carbon steel or high strength steel, and component's scantling are to be complied with CCS Rules and Regulations for the classification of steel ship. For this vessel manufacturing plant of steel plate and structural section of main ship hull is to be approved by classification society and ship-owner.

#### **2.1.2 Strength consideration**

During technical design, longitudinal strength is not only to comply with the requirements of Rules' checking of bending moment and shear force for full-load and ballast conditions with departure and arrival, but also to comply with the requirements of owner's loading condition. So that the structure of this vessel to comply with the requirement of strength and buckling.

#### **2.1.3 Building routine**

Construction is to be completed under supervision of surveyor of classification society and ship-owner representative, and proceeded by construction method of shipyard. Shipyard's construction method is to be selected according to equipment condition including several aspects mentioned specially as follows, and technology is to satisfy better national ship-building standards and classification society's requirements.

##### **(1) Assembly**

For this vessel, the completed structure sections and blocks will be assembled on slipway finally. Construction programs such as assembly process, partitioning sections and so on, should be decided by shipyard, but of classification society's approval.

##### **(2) Pre-installation**

Well, piping, valve, accessories and so on, installed on the hull structure, are to be assembled and installed in block assembly stage as far as practicable.

##### **(3) Marking off**

Marking off is to be done according to conventional standard method of shipyard. When using automatic cut machinery, marking off is unnecessary.

##### **(4) Cut**

Cutting of structure material usually to adopt air cut. Scallop, some small holes such as draining hole and oil flow opening can use punching, and also air cut, and then remove sharp edge and ground as smooth as possible. Much more draining holes are to be opened in double bottom to prevent accumulaton of water.

##### **(5) Plate bending**

Plate bending can use the methods of pressing, rolling, which comply with classification society's requirements.

#### (6) Weld

Electric welding can be adopted in connection of steel components; material, method, technology and inspection of welding are to comply with Rules requirement. Shipyard to construct according to hull structures welding specification of the requirement of Rules. Apart from manual welding, according to different conditions, automatic welding, semiautomatic welding, hidden arc welding, CO<sub>2</sub> gas shielded welding, etc. can be adopted.

When obvious deflection appears after welding of structural components, these components must be remedied through some practical method such as chill-press, justification by line heating and so on.

#### (7) Cast steel

Cast steel of aft shaft hub, is not only to comply with the requirement of classification society for material and machinery performance, but also do heat processing and nondestructive detection according to the requirement of classification society. Intensity standard of nondestructive detection to be adopted agreed by ships owner and classification society.

When welding aft shaft to ship hull, before and after welding, preheating and heating preservation must be done.

#### (8) Remedy

Remedy of local hull structure is to comply with good practice, and be approved by ship-owner respective and class surveyor.

#### (9) Miscellaneous

In the process of construction, some temporary entries and exits shall be set up for easy installation and welding. With ship-owner representative approval, construction openings can be made on the bulkhead, deck, wall, etc. But they should be covered and re-welded under supervision of surveyor and ship-owner representative. And remove all the burr and scars after welding. Paintwork should be done during building section as far as possible, but should be completed in way of welding seam between sections after air-tightness experiment.

Eye plate or some similar small rings installed on hull structure as lifting rings or to fix scaffold, if not affect ship's appearance or condition of working, can be kept. Permanently size, position and number are to be decided by the Builder.

#### **2.1.4 Cut and opening**

Cut, air hole, oil flow hole, draining hole and lightening hole are to be constructed according to related hull structure drawings. Cut technology should be approved by surveyors and ship-owner representatives.

#### **2.1.5 Local reinforcement**

Short longitudinal girder and transversal beam should be set up where longitudinal and transversal beam are cut by mast, ladder, ventilation tubing, etc. to guarantee strength and stiffness.

Reinforced plate, added stiffener, short girder and beam, etc. might be fitted

in way of deck machineries, mooring equipments, life davit, etc.

### **2.1.6 Prevention of hull vibration**

To prevent hull vibration, this vessel to adopt measure as follows:

#### **(1) Structure arrangement**

In the design of hull structure, strength and stiffness are to be considered to prevent vibration.

Web beam, web frame, deck girder and pillar should be set up near engine room where vibration occurs easily. Sidewall of deckhouse of every tier should be aligned, and at least two longitudinal and transversal interior walls should also be aligned in principle.

#### **(2) Screw gap**

Gap between screw and hull or rudder should comply with recommendation of classification society.

## **2.2 Main hull**

### **2.2.1 general**

Design of primary member of hull to be according to the CCS requirement of bulk carrier of Rules and Regulations for the classification of steel ship and Hull structure Instruction of the double side skin bulk carrier,2004.

The hull of this vessel is to be all welded structure.

#### **Structure type**

The vessel to be double bottom and double side skin structure. Double bottom structure to be arranged in engine room, double side and double bottom structure to be arranged in cargo area.

The frame to be mixed-framework. Double side in cargo area, top side tank or part of bottom side tank and double bottom in cargo area to be longitudinal structure. Other areas to be transversal structure.

### **2.2.2 Shell plate**

Longitudinal and transversal seams to connect bottom and side shell plate.

Thickness of shell plate should be complied with Rules; and from the middle ship to aft and fore ends this thickness to be transit gradually (To be constant within 0.5L from amid ship). Shell plate of bulb bow should be strengthened as per Rules. Shell in way of hawse pipe should be strengthened where anchor and anchor chain bump shell easily. Shell connected with stern post should be thickened. And the thickness should comply with the requirement of class.

Opening of the shell plate, such as sea chest, should be with big and fair enough round corner, and made some suitable local strengthening according to Rules and Regulations.

### **2.2.3 Deck plate**

Deck plates to be welded together with longitudinal and transverse seams.

The thickness of upper deck is to be decided according to the rules, and transited the thickness from the middle to the two ends accordingly (keep the same within 0.5L amidships).

A round curve to be adopted at the corner of cargo hold's hatch opening, and engine room casing opening (with thickened plate), as required by the rules.

#### **2.2.4 Bulkhead**

Transverse bulkheads' arrangement to be shown on General Arrangement and construction profile and deck plans.

#### **2.2.5 Bottom structure**

Double bottom in cargo hold to be longitudinal frame structure. The continuous girders and floors to be arranged according to rules requirement. Engine room to be transverse frame, and with solid floor at every frame spacing. Some side girders to be set under the engine; the foundation of main engine should be strong structure.

#### **2.2.6 Side structure**

Side structure in Cargo area shall be longitudinal frame. Longitudinals to be bulb steel.

#### **2.2.7 Upper deck structure**

Upper deck in cargo hold area to be longitudinal frame, and web beam to be set as per the distance in accordance with rule requirement.

Engine room, fore and aft peak area should be transverse frame, and longitudinals to be set in the distance in accordance with rule requirement.

#### **2.2.8 Peak tank and chain locker**

##### **(1) Peak tank**

The bulkhead and top of peak tank should be oil-tight or watertight, and reinforced according to the rule requirement.

To set frame with enough strength in the fore peak tank, and to set perforated platforms, and the distance between the platforms to be less than 2.5m.

Aft peak tank should be stiffened by the floors and web frames.

##### **(2) Chain locker**

Chain locker should be welded watertight steel structure. Stiffeners to be set outside the chain locker. The bottom of the chain locker should set as double-bottom structure, formed a bilge well, bottom should be partially disassemble flat plate with holes on it, it has no wood chain grating. Quick releasing device to be equipped on the top of chain locker, and controlled outside the tank.

#### **2.2.9 Beam and stiffener**

Longitudinal, beam, and stiffener should be bulb steel, angle bar, flat bar, or built-up sections.

When longitudinal and beam pass water tight and oil tight bulkhead, cuts should be welded by collars according to the builder's standard, and be covered.

#### **2.2.10 Web frame and pillar**

Strengthening stiffener to be fitted on the web frame at proper places.

Web frame and pillar connected to the web beam to be arranged in the engine room as per Rules, in order to reduce vibration.

Some web frame and solid floor of proper size to be adopted at the aft, the purpose of it is to reduce slamming and vibration.

#### **2.2.11 Propeller post**

Propeller post to be mixed type of steel casting and steel plate. The welding way of steel casting and steel plate to be low hydrogen electrode.

Among propeller post and rudder, propeller to have proper clearance.

#### **2.2.12 Stem**

Stem to be fabricated by steel plate, with proper size according to Rules.

The fore end of the ship to be a bulbous bow, with a little rake.

The lower part of the stem to be coincided very well with the ship line, and firmly connected to the keel.

#### **2.2.13 Particular reinforcement**

Because the tugboat will push this vessel when it be berthed, it is necessary to make some reinforced parts on the ship' sides, and give out some obvious markings.

Certain strengthening to be made under the foundation of windlass in order to endure the working load of the windlass.

### **2.3 Superstructure and deckhouse**

#### **2.3.1 Deck**

All the deck in the superstructure and deckhouse should be steel structure, and should be arranged with beam and girder. The scantling of it should be in accordance with the classification rule.

#### **2.3.2 End wall, side wall, and internal wall**

The end wall and side wall of superstructure and deckhouse shall be welded flat plate with stiffeners, the scantling of it to be in accordance with rule.

Internal wall shall be welded flat plate with vertical stiffeners, the minimum thickness of it to be of 5mm.

### **2.4 Miscellaneous**

#### **2.4.1 Bilge keel**

The bilge keel to be set on the side bilge with the breadth of 450mm; it should be arranged between FR62~FR156. End of bilge keel shall be fitted on frame position.

Bilge keel should be consisting of flat steel and bulb steel, weld it onto a doubler, and the doubler to be welded onto the bilge strake directly.

The two ends of the bilge keel should be inclined fairly, and decrease toward shell plate, and bigger round doubler to be welded on shell plate.

#### **2.4.2 Foundation**

To set some foundation for generator, boiler, deck machinery and so on. The structure to have enough strength, and to be welded structure.

In order to maintenance, manhole or hand hole to be set under the foundation.

### 2.4.3 Others

In way of ballast tank, peak tank and fresh water tank, sea plug to be adopted. Sea slug to be made of stainless steel, and set in the steel socket flat welded to outside bottom plate, with linarite pad in it, to ensure watertightness. Sea plug should be with thread, and could be tightened or loosened from outboard.

1000mm high steel guardrail to be set at two sides of upper deck. 1000mm high bulwark to be set at two sides of forecastle deck. 1000mm high bulwark to be set at two sides of wheelhouse and 1000mm high steel guardrail to be set in the front of it.

### 3. Outfitting equipment

#### 3.1 Anchor and mooring equipment

This vessel's anchor and mooring equipment according to CCS rules shown on the following table:

Item	Quantity	Specification	Remark
Bow anchor	2	6450kg SPEK anchor	
Spare anchor	1	ditto	
Chain	Total length=605m	AM3, $\Phi$ 62 stud link chain cable	
Mooring rope	8	$\Phi$ 64mm polypropylene fibre rope	Breaking strength 422 KN, length 200m
Towing rope	1	44ZAA6 $\times$ 37+FC1670ZS	Breaking strength 1259KN, length 240m

Remark: Spare anchor to be fitted at proper position on the front of upper deck, equipped with fixed part such as hoop choke and so on.

#### 3.1.1 Anchor equipment

Anchor equipment outfitting to be as the following table:

Item	Qty	Installation position	Type and material
Roll lever chain stopper	2	Forecastle deck	
Chain stopper	2	Forecastle deck, inlet of hawse pipe	To consist of steel cable, rigging screw, shackle and so on
Buckler	2	Idem	To be welded with steel plate, movable
Hawse pipe	2	Between forecastle deck and shell plate	To consist of two semisteel plate pipes, strengthened with cast steel flange at the outlet of anchor bed.
Closure cable releaser	2	On the casing wall of chain locker	
Chain pipe	2	Between forecastle deck and chain locker	

Anchor chain	2	In the chain locker, out end linked with anchor and inner end linked with cable releaser	AM3 anchor chain steel, $\Phi$ 62 stud link chain cable
<p>Remarks: (1) Anchor chain port 11 knots. Starboard 11 knots, length of every chain knot is 27.5m, chain knots to be connected to each other by kent-type connecting link, the fore chain knots' circumrotating is not to be disturbed when anchor to be in the stowing status.</p> <p>(2) Additionally equipped with 6 kent-type shackles, 2 buoy shackles, 2 chain end shackles.</p> <p>(3) Sea water washing system to be fitted for the hawse pipe, there to be at least 3 nozzles for every hawse pipe</p> <p>(4) Position of hawse pipe's outlet at the shell is to make anchor not colliding with bulbous bow when running out. (to fit anchor stand if necessary, instead of anchor recess)</p>			

### 3.1.2 Mooring equipment

Item	Qty	Position	Type and material
Mooring line	8	4 pieces on the warping winch of the forecastle and poop deck respectively	Φ 52 polypropylene fibre rope, length=200m per piece.
Towing rope	1	In the storage of fore part of upper deck	1670ZS steel cable, length=240m
Panama type mooring chock	1	1 pieces at the forecastle deck	
B-type two rollers fairlead φ 300	8	4 pieces at the forecastle deck; 4 pieces at the poop deck	
Φ 500 bollard	12	2 pieces at the forecastle, 6 at the upper deck, 4 at the poop deck.	
Φ 710 bollard	3	3 piece at the forecastle deck	
Cleat pedestal one roller fairlead A350	6	2 pieces at the forecastle deck, 4 at the poop deck	
Panama type mooring chock BP360	3	3 at the poop deck	
Panama type mooring chock AC360	8	2 at the forecastle, 6 at the upper deck	
Lyle gun (pneumatic)	2	1 piece at the forecastle deck and 1 piece at poop deck	With 35m, Φ 8 polyamide fibre rope

Above quantity to be according to mooring arrangement plan, and some may be slightly adjusted.

Permissible load on Bollard to be marked with welding trail and paint. All the rollers to be with grease nozzle, and all the grease nozzles to be of the same type. Grease nozzles used for mooring equipment to be universal.

### 3.2 Rudder equipment

#### 3.2.1 Rudder blade

The vessel to be provided with one streamline semi-balanced hanging rudder. Its area to be 16.916m<sup>2</sup>. Rudder blade profile with NACA-00. Rudder blade to be fabricated by steel plate. Rudder blade flange housing and below rudder pintle dumb brace to be of steel casting. Rudder blade scantling to be to comply with requirement of Rule. When steel casting to be welded on steel

plate, steel casting shall be preheating. To be grooved in way of welding space of steel plate and steel casting. Horizontal and vertical web to be fitted inside rudder blade. The webs to be scalloped to form drain hole. Each three (3) sets stainless steel filling and drain plugs shall be fitted on top and bottom of rudder blade. Rudder blade shall be also fitted lifting hole. Tar epoxy enamel should be coated within rudder blade.

### **3.2.2 Rudder stock**

Rudder stock is to be made of carbon forged steel. Designed according to requirement of Rule, connection between face-flange bolt and Rudder blade should be located on the lower end of rudder stock. Tiller should be connected to the upper end of rudder stock by key.

### **3.2.3 Upper rudder bearing**

Upper rudder bearing is to be of plane friction water-tight bearing. Top rudder stock in way of upper rudder bearing and lower rudder stock should be all added stainless steel liner. Upper rudder bearing housing is to be of fabricated structure welded to hull.

### **3.2.4 Rudder pintle**

Rudder blade is to be connected to rudder horn by upper and lower rudder pintles. Material of rudder pintle to be of marine forged steel. Friction wrapper of rudder pintle to be of cast aluminum bronze liner.

### **3.2.5 Other**

One set of special bolt spanner for disconnecting rudder to be supplied by shipyard, ordinarily they are fixed at the suitable position in steering gear room.

Suitable quantity eye plates are to be fitted on aft shell plating for lifting rudder and propeller.

## **3.3 Mast and lamp hanger**

Fore mast to be set on the aft part of forecastle deck of this vessel.

Radar mast to be set on the aft part of compass deck.

The arrangement of signal lights on the fore mast and radar mast to be in accordance with the requirements of International Regulations for Preventing Collisions at sea, and its Amendments.

## **3.4 Life saving equipment and boat davit**

### **3.4.1 Life saving equipment**

The outfit of life saving equipment shown on the following table

Item	Qty	Material	Remark
Lifeboat to be of glass-reinforced plastic construction, totally enclosed.	1	Glass-reinforced plastics	Complement: 25 persons
Rescue boat	1	Glass-	6 persons

		reinforced plastics	
Inflatable life-raft	3	A-type , Glass-reinforced plastics	Two with complement of 25 persons, one of them adopt launching appliance ,one with complement of 6 persons,arranged on forecastle deck.(each equipped with hydrostatic pressure releaser)
Lifejacket& immersion suits	36 for each		
Life buoy	12	Foam polyurethane	Upper deck: 2 Forecastle deck: 2 Navigation deck: 2 Boat deck: 4 Poop deck: 2 6-life buoy with self-igniting buoy light, 2-life buoy with self igniting smoke signal, 6-life buoy with buoyancy lifeline (30m length)

Notion: every person should be fitted with a lifejacket which is kept in respective room, 2-for wheelhouse,1-for pilot room,2-for E/R monitoring room,1-for hospital,2-for forecastle deck.

every person should be fitted with a immersion suit which is kept in respective room, 2-for wheelhouse,1-for pilot room,2-for E/R monitoring room,1-for hospital,2-for forecastle deck.

All the life-saving equipments are to comply with the requirements of SOLAS convention and its amendment.

### 3.4.2 Boat davit and rack of life-raft

Boat davit adopt free-fall appliance, rescue boat adopt crane.

2 pieces of rack of life-raft to be respectively fitted at the port and starboard

on the aft part of boat deck. To set another one on the aft part of forecastle deck.

### **3.5 Hatch cover and manhole cover**

#### **3.5.1 Minitype hatch cover**

A 630×630 weather tight hatch cover to be fitted at cargo hold passage on the upper deck, the coaming height to be 600mm. One 630×630 weather tight hatch cover to be fitted on the poop deck, to be used as the exit of steering gear room, the coaming height to be 450mm. A  $\phi$  600 weather tight hatch cover to be fitted in front of forecastle deck, to be used to the lifting of the mooring cable, the coaming height to be 600mm.

#### **3.5.2 Manhole**

600×450 manhole cover to be fitted on top of the forepeak tank, aftpeak tank and all liquid tank.

Material of manhole's bolt to be stainless steel, nut's material to be brass.

### **3.6 Ladder**

#### **3.6.1 Accommodation ladder**

Quantity	2
Material	Aluminium alloy
Type	Foot step to be of circle arc fixed type, and of automatic housing type
Width of the ladder	600mm
Specification	When distance from the top of lower foot step platform to ballast waterline exceed 700mm, angle between stairway stringer and horizon to be about 55°, 34 steps, length to be 11600mm.
Storage's way	At two sides of upper deck
Lifting way	After finishing retracting action, to move into side horizontally, to be fitted by electric accommodation ladder winch
Test load	To be laid horizontally, 75kg-load on every foot step, 150kg-load on lower platform, 300kg-load on the upper platform.

#### **3.6.2 Pilot ladder**

Pilot ladder to be fitted at the upper deck close with the accommodation ladder. The length of the ladder to be 12m. Foot steps are to be made of wood.

#### **3.6.3 Working ladder**

An aluminium ladder for draft measurement.

A 7m-length aluminium wharf gangway with rail and manrope

### **3.6.4 Inclined ladder**

Inner ladder to be inclined ladder from upper deck to navigation deck, whose width to be 800mm, and angle to be 50°. Outside ladders to be inclined ladder, whose width to be 700mm and angle to be 55°. All the ladders to have granite foot steps, with stainless steel handrails for inside and steel pipe handrails for outside ladders. Foot steps to be arranged inside the bulwark on the forecastle deck, in order to use it when lifting and casting the anchor.

### **3.6.5 Vertical ladder**

Vertical ladders are to be provided at the manhole and small hatch cover, ladder width to be 400mm. ladder to use square steel foot steps. The distance between ladder and wall should not be less than 150mm. U-type square steel foot steps in the ventilators, masts, crane pillars, oil service tank and service tank of engine room, are to be welded on the structure.

## **3.7 Guardrail and accommodation rail**

### **3.7.1 Guardrail**

Guardrail to be provided at the edge of every deck where there is no bulwark. Guardrail height to be 1000mm above deck, top rail to be galvanized water gas pipe and nominal diameter to be 42, with thickness of 3.5, middle accommodation rail to be 20 round steel, stanchion to be 60×16mm flat steel.

### **3.7.2 Storm rail**

Storm rail to be provided at weather outer wall, and to be galvanized water gas pipe and nominal diameter to be 32, with thickness of 3.5.

Stainless storm rail to be provided properly at the front wall of wheelhouse and the aisle of accommodation quarter. Accurate size to be decided on the spot.

## **3.8 Canvas work**

Canvas wind break to be provided on the forecastle deck for this vessel.

Canvas to be provided for lifting type hatch cover in cargo area, with press to ensure its weather tightness.

Canvas to be provided for the following equipments of weather deck, and to print with equipments' name.

Magnetic compass

Gyrocompass repeater

Loudspeaker

Searchlight

Accommodation ladder winch

Boat hoisting engine

Windlass and cable drum of mooring engine

Lifeboat embark light

Accommodation ladder light

Mooring winch

Embarkation ladder  
Daylight signaling lamp  
Other necessary positions

### **3.9 Miscellaneous**

#### **3.9.1 Staff**

Jack staff and poop staff are to be set up on fore and aft respectively. The staff shall be assorted with small roller and polypropylene halyard.

Eye splice, eye plate, and cleat are to be set up on the suitable space.

#### **3.9.2 Fire fighting equipment**

The fire fighting equipments on the ship to be equipped according to "Rules". Each type of portable fire extinguisher to have two set of spare parts. To have one set of emergency escape respirator used for training on the ship.

To arrange proper quantity of aqueous foam extinguisher and dry powder extinguisher on the ship, to arrange hose locker (including hose, nozzle, etc.), the hinge of hose locker, switch handle, etc. accessories to be stainless steel. Each hose locker to have one copper wrench of F type, and one hook spanner.

#### **3.9.3 Grating**

Galvanized steel gratings to be arranged on the platform of deck machinery, on the operation platform of steering gear room, and around the crossover pipelines.

Wood grating or rubber mattress to be arranged in the paint room, clothes room, refrigerated warehouse, galley, and compass deck. The grating should be designed to be easily dismantled for cleaning and repackaging, the surface of it to be protected by paintings.

#### **3.9.4 Reflective tape**

Lifeboat, life raft and life buoy to have reflective tape.

## 4. Deck Machinery

### 4.1 General

Deck machinery to be arranged as shown on the General Arrangement Plan and Equipment Arrangement Plan.

Items of deck machinery to be as follows:

Name	Type	Qty	Rating	Motor power (Every set)
Windlass	Electro-hydraulic-windlass independent type with mooring drum.	2	Chain:AM3class φ 62mm Pull: 183KN Speed: ≥9m/min Mooring drum: pull: 100KN Speed: 15m/min Assistant drum pull: 100KN	Provided by hydraulic unit 22KW × 2
Mooring winch	Electro-hydraulic type.	2	Mooring drum: pull: 100KN Speed: 15m/min Assistant drum pull: 100KN	55KW × 2
Crane	Electric type	2	Working load: 1t Maximum working radius: 16m	
Steering gear	Ram-type	1	Rated torque: 530KN · m Helm angle 35° to the other 30°, rudder rotate time: 28seconds	22KW × 2
Winch of accommodation ladder	Complete with accommodation ladder	2	Supporting load: 30KN	2.2KW

Note: Windlass ,winches and accommodation ladder winch to have left and right types.

Windlass, winches, steering gear etc. accord to manufacturer's standard.  
Proper oil collect utensil to be provided around the hydraulic and deck machineries

#### 4.2 Windlass

Two horizontal type electro-hydraulic combined windlass to be arranged on the forecastle deck. Each windlass to be provided with one chain wheel, two pavilion type mooring drum, and one gipsy head. Chain wheel and mooring drum to be provided with a clutch and manual brake, when the mooring drum's clutch break away, it can control the gipsy head independently. Remote control handle to be provided at its side.

The drum capacity to be  $\phi 64 \times 240\text{m}$ , with baffle plate at intermediate.

The power of windlass to be arranged at the hydraulic station in front of the upper deck.

Windlass to have product certificate.

#### 4.3 Hydraulic Mooring winch

Two electro-hydraulic mooring winches with two drums and double gipsy head to be arranged on the poop deck. The drum capacity to be  $\phi 64 \times 200\text{m}$ , with baffle plate at intermediate. Each mooring drum to be equipped with a clutch and manual brake, when the mooring drum's clutch break away, it can control the gipsy head independently. Remote control handle to be provided at its side.

The power of the mooring winch to be arranged in steering gear room.

Mooring winch to have product certificate.

#### 4.4 Hoisting equipment

One set of sundries crane (2t  $\times$  10m) and one set of crane & rescue boat davit (2.1t  $\times$  10m) to be arranged at the aft of boat deck.

Three sets of crane (30t  $\times$  28m) to be arranged at middle of upper deck.

#### 4.5 Hydraulic steering gear

To fit one set of electro-hydraulic Ram-type steering gear and two pump units, each pump unit to consist of motors, valves and oil tanks. The control valve and motor could be controlled directly from the wheelhouse or steering gear room. Reliable radiator to be provided in the steering gear circulation oil tanks.

Steering gear to be driven by any one of the pump units.

One pump unit to turn from one side  $35^{\circ}$  to the other side  $30^{\circ}$  in 28 seconds, when the vessel to be at the full speed.

Wheelhouse to be able to realize auto-steering, subsequent-steering, holder-steering using auto-steering device. To perform manual emergency

steering in steering room.

Automatic alarm device in case of power-off, overload, low liquid level, open-phase to be arranged in the wheelhouse and engine control console room.

Rudder angle indicators to be arranged in wheelhouse and steering gear room.

Hydraulic steering gear to have product certificate.

#### **4.6 Winch of electric accommodation ladder**

Electric winch of accommodation shall be arranged at two sides in front of poop deck.

Winch of accommodation ladder to have product certificate.

#### **4.7 Deck machinery spare parts**

Deck machinery spare parts to be in accordance with Class and Ship Owner requirements.

## **5. Accommodation rooms**

### **5.1 Accommodation arrangement**

#### **5.1.1 Navigation space**

Wheelhouse to be set on the navigation deck.

#### **5.1.2 Working space**

One electrician room, one engine department office, one deck department office and one gymnasium room to be arranged in the aft of upper deck.

#### **5.1.3 Public space**

An officer mess room for 12P and a crew mess room for 18P to be arranged on the poop deck. One meeting room and one crush-room for officers to be arranged on the poop deck.

#### **5.1.4 Passage and stairway**

Internal passage(1200mm width) to be arranged except for navigation deck. Every deck to set round stairways(800mm width).

#### **5.1.5 Sanitary space**

Independent sanitary unit to be arranged for each room (to use prefab sanitary unit or not to be decided by builder), to set one public toilet on navigation deck, poop deck, and in accommodation area on upper deck.

#### **5.1.6 Service space**

To set laundry, dry room and shift room on the upper deck. To set galley on the poop deck. To set hospital on the boat deck. To set **drying room** on the captain deck.

#### **5.1.7 Store space**

To set a **chart house** on the navigation deck;

To set a store room on the captain deck;

**To set a store room on the crew deck;**

To set a store room on the boat deck;

To set a store room on the poop deck;

To set a pumping room, a cable room, and a paint room in the front of upper deck;

To set a store room, fish, meat, and dry store room in the accommodation area on the upper room.

#### **5.1.8 Firefighting space**

One CO<sub>2</sub> room to be arranged at the aft part of upper deck to protect engine room and cargo hold.

#### **5.1.9 Emergency power space**

**To set battery room, charging room and store room one for each on navigation deck;** to set an emergency generator room on the boat deck.

#### **5.1.10 Other space**

To set an air conditioning room on the upper deck.

#### **5.1.11 Living room**

To set a set of combined room(include bedroom and day room) for captain and C/engineer on the captain deck; to arrange owner room,pilot room, 4/engineer room and 3/officer room on the captain deck. To set C/officer , 2/officer, 3/engineer and apprentice room on the crew deck. To set 8 crew rooms on the boat deck. To set 6 crew rooms on the poop deck. To set 2 crew rooms at the aft part of upper deck.

## **5.2 Accommodation equipment**

### **5.2.1 Wheelhouse**

Basic equipment as below:

- 1 - Chart table
- 1 - file cabinet
- 4 - telescope
- 1 - combination telegraph table
- 1 - flag box
- 1 - pilot chair
- 2 - soft chair
- 1 – thermos rack

### **5.2.2 Electrician room**

Basic equipment as below:

- 1 – work table
- 1 – chair with back
- 1 – store cabinet

### **5.2.3 Engine department office**

Basic equipment as below:

- 1 - long desk
- 1 - chair with back
- 1 - file cabinet
- 1 – long sofa
- 1 – washbasin
- 1 – thermos rack

### **5.2.4 Deck department office**

Basic equipment as below:

- 1 - long desk
- 1 - chair with back
- 1 - file cabinet
- 1 - long sofa
- 1 - washbasin
- 1 - thermos rack

### **5.2.5 Office mess room**

Basic equipment as below:

- 1 - 12p round dining table
- 12 – turning chair

- 1 – clothes rack
- 1 – drinking fountain
- 1 – refrigerator with two doors
- 1 – wash basin
- 1 – cupboard

#### **5.2.6 Crew mess room**

Basic equipment as below:

- 2 – 8p long dining table
- 1 – 4p long dining table
- 18 – fixed type turning chair
- 1 – TV combination cabinet (with 29' color TV, DVD, and multi-functional acoustics)
- 1 –cupboard
- 1 – clothes rack
- 1 – drinking fountain
- 1 – refrigerator with two doors
- 1 – wash basin

#### **5.2.7 Gymnasium**

Basic equipment as below:

- 16 – chair with back
- 1 - tennis table (foldable)
- 1 – sundries cabinet
- 1 – gymnasium equipment(according to the Owner's requirement)
- 1 - thermos rack

#### **5.2.8 Meeting room**

Basic equipment as below:

- 1 - L type sofa
- 16 - soft chair with back
- 1 - elliptic table
- 1 - TV combination cabinet (with 29' color TV, DVD, and multi-functional acoustics)
- 1 – clothes rack
- 1 – drinking fountain

#### **5.2.9 Officer's crush-room**

Basic equipment as below:

- 1 – TV combination cabinet (with 29' color TV, DVD, and multi-functional acoustics)
- 1 – clothes rack
- 1 – drinking fountain
- 1 -long sofa
- 4 -single sofa
- 1 -tea table

#### **5.2.10 Sanitary space**

(1) Sanitary unit to be equipped with:

- 1 – shower (stainless steel)
- 1 - squatting type stool device
- 1 – paper box (stainless steel)
- 1 – basin (for washing face)
- 1 – towel bar (stainless steel)
- 1 – mirror box
- 1 – soup box (stainless steel)
- 1 – handrail (stainless steel)
- 1 – shower curtain

1 – plastic paddle (700×700)

1 – cloth hock (stainless steel)

(2) Public toilet to be equipped with:

**1 – squatting type stool device**

- 1 – basin (for washing face)
- 1 – mirror box
- 1 – soup box (stainless steel)
- 1 – handrail (stainless steel)
- 1 – cloth hock (stainless steel)

#### **5.2.11 Laundry**

Basic equipment as below:

- 1 - 5-7kg washing machine
- 1 - stainless steel washing table
- 2 – wash basin
- 1 – clothes rack

#### **5.2.12 Dry room**

Basic equipment as below:

- 1 – dry machine
- 1 – clothes rack
- 1 - iron plate

Other equipments (according to Owner's requirement)

#### **5.2.13 Shift room**

Basic equipment as below:

- 26 – clothes changing box
- Cloth hock and long stool

#### **5.2.14 Hospital**

Basic equipment as below:

- 1 – sick bed (2000×800)
- 1 – wardrobe
- 1 – writing desk
- 1 – soft chair

- 1 – 3P sofa
- 1 – medicine cabinet
- 1 – thermos rack

### 5.2.15 Galley

Basic equipment as below:

- 1 - Marine electric range (four eyes)
- 1 - Marine galley refrigerator (freezing 100L, cold storage 100L)
- 1 - Flour blender
- 1 - Boiling pot
- 1 - Multipurpose galley machine
- 1 - Electric oven
- 2 - Stainless steel washing pool (with cold and hot water hose, one each for one eye and two eyes)
- 1 - Stainless steel pantry desk washing pool (with cold and hot water hose)
- 1 - Stainless steel working table
- 1 - Stainless steel shelf of bowl and small dish
- 1 - Stainless air gathering cover
- 1 - Writing board
- 1 - Chopping block and rack
- 1 - Sewage barrel
- 1 - Electric dinner service disinfect tank of 100L
- 1 - Meat chopper
- 1 - Soya milk machine
- 1 - Stainless steel working table with cabinet and drawer
- 1 - Electric boiler barrel
- 2 - Electric rice cooker
- 1 - micro-wave oven

### 5.2.16 Accommodation

Its basic items to be as below:

Class	Room	Bed size	Wash room
Captain, Chief engineer,	Bedroom	Bed(2100×1400), night table, wardrobe, desk, soft chair, safe, thermos bottle rack	Prefabricated or to be fabricated on the spot.
	Day room	Writing desk, swivel chair, computer, file cabinet, single sofa, tea table, TV combined cabinet, two-door refrigerator	
Shipowner	Single room	Bed(2100×1000), night table, wardrobe, desk, soft chair	Prefabricated or to be fabricated on the spot.

C/Officer, 2 <sup>nd</sup> Engineer,	Single room	Bed(2100×1000), night table, wardrobe, desk, soft chair, L type sofa, tea table, two-door refrigerator, thermos rack	Prefabricated or to be fabricated on the spot.
2 <sup>nd</sup> /Off, 3 <sup>rd</sup> /Off, 3 <sup>rd</sup> /Eng, 4 <sup>th</sup> /Eng	Single room	Bed(2100×1000), night table, wardrobe, desk, soft chair, L type sofa, thermos rack	Prefabricated or to be fabricated on the spot.
Pilot room , Boatswain, Mechanist commander, Crew(two-men ), apprentice (two-men)	Single room	Bed(2100×900), wardrobe, desk, soft chair, sofa, thermos rack	Prefabricated or to be fabricated on the spot.

Bedding shall be complement according to double number of berth, total of 50 sets.

Each set of bedding to consist of: bed mattress (with spring or sponge) bedspread, pillowcase, quilt cover, towel used to cover a pillow, berth mat, pillow mat, towel quilt.

Cover of sofa shall be complemented as double times according to practical number.

### **5.3 Accommodation upholstery**

#### **5.3.1 General**

- (1) The anti-fireproof integrity of the accommodation to be in accordance with the rules for cargo ships' fire fighting.
- (2) The deck of workshop, store, and accommodation, etc. on the top of engine room to be in accordance with A-60 Standard.
- (3) The accommodation space height to be not less than 2000mm.

#### **5.3.2 Upholstery materials**

- (1) All insulation materials used in the rooms on the superstructure to be non-combustible materials approved by classification.
- (2) Non-combustible materials approved by classification to be proposed in insulation liner and ceiling in living space, service space, internal passage, stair girdle, monitor room, etc. on the superstructure.
- (3) Approved materials to be adopted in deck coverings of living space, service space, wheelhouse, etc. on the superstructure, which are non-combustible, or without poisonous flame and explosive danger at high temperature.

### 5.3.3 Casing wall system

- (1) According to the requirement of IC rules, the casing wall and ceiling to be designed to composite rock wool panel. The finished surface of composite rock wool panel of wall and ceiling of galley and pantry room to be stainless steel, the lower part of 150-300mm to be tile.
- (2) The thickness of composite rock wool panel wall to be 25mm and 50mm, 25mm to casing wall, 50mm to independent casing wall.
- (3) Ceilings to be composite rock wool panel of 25mm thickness.

## 5.4 Insulation

### 5.4.1 Heat insulation

Space	Insulation	
	Material	Thickness (mm)
Ceiling and casing wall in accommodation, public space, workshop, store, WC, etc. which face to sun directly.	Rock wool	Ceiling, 50mm; Wall, 50mm
The bulkhead of air conditioner room face to internal passage.	Rock wool	50mm
Ceiling and bulkhead of dry room.	Rock wool	50mm

### 5.4.2 Noise insulation

Space	Insulation	
	Material	Thickness (mm)
Wheelhouse and other rooms, Walls next to internal passage.	Rock wool	50mm
Walls between accommodation and some public rooms.	Rock wool	50mm
Monitoring room.	Rock wool	50mm

Note: (1) Deck and bulkhead with insulation materials, when confront steel casing wall and deck vertically, extend the insulation materials 450mm to the inside.

(2) Covering insulation materials to be clingy to deck and bulkhead, thickness of 30mm insulation materials to be covered on the beam, girder,

frame.

### 5.4.3 Bulkhead coverings

Space	Ceiling		Wall	
	Materials	Surface	Materials	Surface
Main stairway enclosure	25mm composite rock wool panel	PVC	25mm composite rock wool panel	PVC
Internal passage on Upper deck and above	25mm composite rock wool panel	PVC	25mm or 50mm composite rock wool panel	PVC
Accommodation, public space, and clothing room	25mm composite rock wool panel	PVC	25mm or 50mm composite rock wool panel	PVC
Galley	25mm composite rock wool panel	0.7mm stainless steel sheet	25mm composite rock wool panel	0.7mm stainless steel sheet, below 150-300mm tile
Dry room	30mm composite rock wool panel	0.7mm stainless steel sheet	25mm composite rock wool panel	
Monitoring room	Composite rock wool panel with high noise insulation performance	PVC	Composite rock wool panel with high noise insulation performance	PVC
Ceiling and bulkhead of CO <sub>2</sub> room	50mm composite rock wool panel	0.5mm galvanized sheet	25mm composite rock wool panel	0.5mm galvanized sheet

Note: (1) The front of 25mm composite rock wool panel to be PVC plate, back face to be galvanized steel panel; two sides of 50mm composite rock wool panel to be PVC plate.  
(2) The color of PVC plate to be approved by Owner.

### 5.5 Deck coverings

Deck coverings arrangement to be as below:

Space	Deck coverings
Internal passage on Upper deck, clothes change room and main passage above the engine room	A60 deck coverings, with 2mm fireproof flooring materials
Accommodation, internal passage of public space, main passage above the Poop deck	Thin deck coverings, with 2mm non-combustible flooring materials(1m width additional plastic mat in wheelhouse)
Battery room	40mm cement bottom, with anti-slippery tile with slot

Pantry room, laundry, public bathroom, public toilet, dry room, galley	40mm cement bottom, with anti-slippery tile
Air conditioner room, emergency generator room	Bare deck painting 1m wide rubber blanket to be arranged in front of the emergency switchboard.
Electrician room	Rubber blanket
CO <sub>2</sub> room (aft of upper deck)	Bare deck painting
Dry provision room	A60 deck coverings, with wood gratings
Monitor room	Deck coverings, with fireproof flooring materials on, 1m wide rubber blanket to be arranged in front of main switchboard.
<p>Note: (1) All weather deck to be painted with bare deck painting.  (2) A drainage slot of 200mm width to be arranged in galley.  (3) Fireproof floor and plastic floor to be a whole part.  (4) Round rubber branket to be placed on the stair to weather deck.  (5) Carpet to be arranged in Captain and Chief engineer room.</p>	

### 5.6 Doors and windows

The open location of windows on wheelhouse to be in accordance with IMO A708(17) Resolution — the requirement of Wheelhouse Sight Guideline, 1992.

#### 5.6.1 The configuration of external wall of superstructure and deckhouse:

Item	Net width (mm)	Space
Weather tight steel door and steel door	650-800	The weather tight movable door to be arranged on the aft wall of the upper deck, poop deck, and navigation deck. The outside door of the deckhouse over the poop deck to be steel door.

#### 5.6.2 The configuration of accommodation door to be as below:

Item	Net width (mm)	Space
Noise insulation Al-door with glass	700	Engine monitor room
A class Fire-proof door	650~700	In accordance with A class fire-proof integrity of bulkhead, such as engine room, stairs, more than 4m <sup>2</sup> store room, etc.

B class Fire-proof door	650~700	In accordance with B class fire-proof integrity of bulkhead, such as accommodation, under 4m <sup>2</sup> store room, public toilet, etc.
non-watertight steel door	700	Non-watertight requirement purifier room, workshop and spare room in engine room
<p>Note: (1) All weather tight steel doors to be in accordance with Class Standard.  (2) The height of doorsill to be in accordance with Load Line Regulation.  (3) The stair door, engine room enclosure door, escape door in passageway to be equipped with self-closing equipment.  (4) All doors to be provided with locks and holders, stair door with holders only.  (5) Escape exit and wind grating to be provided for doors of accommodation rooms.</p>		

### 5.6.3 Rectangular windows and Scuttles

Window frame materials	Type	Space
Steel scuttles	Φ 350 (with storm cover), details to refer to “metal doors & windows arrangement”	Outside wall of poop deck
Steel rectangular windows	Details to refer to “metal doors & windows arrangement”	Outside wall above poop deck (Steel rectangular windows on the first tier of bulkhead above poop deck to be with storm cover)
Noise insulation Al-window	Details to refer to “metal doors & windows arrangement”	Engine monitor room

### 5.7 Curtain

As per below:

Items	Quality	Space	Quantity
Window curtain	Textile approved by owner	Accommodation, public space, workshop (except wheelhouse)	Two slots of curtain to be arranged in captain room, C/Engineer room, Owner room, C/Officer, 2/Engineer, and public accommodation, one to be mesh gauze. Other accommodation with one.
Shower curtain	Anti-water nylon	Personal toilet	One for each shower

Note: Windows face to forward to be arranged with roller blinds type sun shading curtain.

**5.8 Decoration picture**

All public space to be provided with decoration picture, and some to be beautified according to design requirement (imitation), whose kind and quantity to be approved by owner.

**5.9 Hardware**

- (1) To dispose stainless steel and chrome-copper door lock for each door of accommodation, public place. Each lock to be deposited three (3) keys. Additionally, to dispose five master keys.
- (2) All accommodation to be provided with door holder, except those unnecessary or impossible.
- (3) Key boxes to be deposited in the room of Captain, C/Officer, 2<sup>nd</sup> Engineer, Boatswain.

## **6. Painting and cathodes Protections**

### **6.1 Surface preparation**

All oxidizing layer and rust on the steel structure to be grit blasted before treatment, to be in accordance with the requirement of CB8923-88 "Corrosion and Rust Cleaning class for plate surface before painting" in Sa2.5.

Shop primer to be provided on the plate surface after the blasting (no more than 6 hours), in order to protect the corrosion in the process of construction. Shop primer to be in accordance with the builder's convention, and approved by Owner.

Parts of shop primer of burnout and deteriorated because of cutting and welding are to be removed, and to be repaired promptly.

All forging, casting, equipment, outfitting, boxes and lockers not connected to the hull not to be treated with acid.

Except the part to be grit blasting, according to Builder's convention, grinding wheel or steel brush could be also used to remove the rust, dust, contaminated oil, etc before painting.

The requirements of secondary surface treatment to be needed for: outside surface of hull, outside surface of superstructure and deckhouse to meet the standard of st2.5. The control of humidity/temperature and dry painting film thickness to be in accordance with the manufacture's recommendation.

### **6.2 Painting**

Painting to be not conducted on the following surfaces: rough wooden board in store room, polished product, hardware, canvas product, window glasses, window screen, etc. and any other part and equipment surface, because the performance of the equipment will be affected by the painting.

Cement should be used in places with poor accessibility to improve drainage. The thickness of dry painting film and painting workmanship to be in accordance with the suggestion of the manufacturer. Paint application should be carried out in the direction of paint manufacturer.

All galvanized pipes (fittings) to be painted should be painted on a layer of galvanized paintings firstly. The color of pipes and markings to be approved by the owner.

The hull seams to be tested should be painted primer after the re-blasting, and protected by tapes, to avoid the impact to perform tight-test because of the anti-rust coatings.

Hull (freeboard and bottom area) painting to be guaranteed for three years period.

The type and color of the paintings to be negotiated between paint manufacturer and ship owner.

## Paint table (just for reference, to be in accordance with manufacturer)

Area	Paint name	Film thickness ( $\mu$ m)
Bottom to waterline (vertical part):	Wearing epoxy primer	1 × 125
	Epoxy middle paint	1 × 125
	Self-polishing antifouling coating tinless	2 × 130
Bottom to waterline (flat bottom):	Wearing epoxy primer	1 × 125
	Epoxy middle paint	1 × 125
	Self-polishing antifouling coating tinless	2 × 100
Outside of freeboard, poop and deckhouse:	Modified epoxy paint	1 × 75
	Modified epoxy paint	1 × 75
	Polyurethane lacquer	2 × 50
All weather decks (including upper deck):	Modified epoxy paint	2 × 75
Surface without insulation layer in superstructure and deckhouse, fi-fi pump room, engine room, emergency pump room, steering gear room, store room, etc. plate surface and floor exposed	Alkyd primer	2 × 40
	Alkyd finishing coat	2 × 40
Surface of insulation layer: (including inner cool room)	Alkyd primer	2 × 40
Ballast tank and chain locker:	Light epoxy paint	2 × 150
Double bottom of engine room, sewage well, void space, gutterway, etc.	Light epoxy paint	2 × 100
Interior surface of funnel:	Alkyd primer	2 × 40
	Alkyd finishing coat	2 × 40
Exterior surface of funnel:	Modified epoxy paint	1 × 75
	Polyurethane lacquer	2 × 50
Exhaust pipes:	Aluminum heat-resistant paint	2 × 25
Internal surface of fresh water tank:	Without toxic epoxy water tank painting	2 × 150

## Note:

\*Paint application complement for marine fittings and pipes to be correspondent with its location.

\*No paint application in the fuel oil tank and diesel oil tank.

\*Anti-skip paint to be coated on the weather deck frequently used (such as forecastle deck, poop deck, passages on upper deck, outside passages of deck house, etc.)

\*The interior side of the enclosed type foundation of mooring equipment such as bollard to be coated with one coat asphalt paint.

\*Number of hull painting piles to be recommended by the makers.

\*Ballast tank coating to be guaranteed for five years period.

**6.3 Paint spares**

Specification and quantity of paint spares to be in accordance with owner's requirements.

**6.4 Cathodes protection**

Zinc anodes to be welded on the outboard surface of the ship shell and inside surface of the ballast tanks, its location and quantity to be in accordance with the requirement of Sacrificial Anode Calculation.

## **7. Navigation and Signal equipment**

### **7.1 Navigation equipment**

To provide the following navigation equipment on the ship:

- 1 - reflective magnetic compass
- 1 - three face rudder angle indicator (with 2 auxiliary indicator)
- 1 – astronomical clock
- 2 – sextant
- 1 – stopwatch
- 1 – star identifier
- 2 – aneroid barometer
- 2 – thermometer
- 1 – auto-barometrograph
- 2 – dry and wet thermometer
- 1 – water temperature gauge
  
- 2 – 7×50 binoculars
  
- 2 – magnifying glass
- 1 – protractor
- 1 – azimuth finder
- 1 – divider
- 2 – triangle plate
- 1 – parallel ruler
- 2 – pendulum type gradometer
- 2 – sleet sweeper
- 3 – parallel wiper

Gyrocompass receiver, autopilot, rudder angle indicator, shaft tachometer receiver, wireless navigational aids, echo sounder receiver, VDR, and weather facsimile receiver, etc. to be provided according to the requirements of “Electric Specification”.

### **7.2 Signal equipment**

The arrangement of signal equipment to meet the requirement of “International Regulation for Convention of Collision at Sea”, including a copy of the regulation (Chinese/English). Details to refer to “Signal equipment arrangement”.

### **7.3 Spare and inventory**

The spare parts and some other inventories of navigation and signal equipment should be provided according to the requirement of Rules and Regulations.