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Part I: GENERAL

1.1 PREFACE

It is the intent of the Specifications to give technical descriptions to hull construction, out-fittings, machinery, and electrical installation of the 4500t lifting capacity crane barge.

Any equipment or spare parts not mentioned in this document but required by Classification Society should be supplied in accordance with designer's plan and MTO. Anything twice or more mentioned in the Specifications is to be only once supplied or executed.

Unless noted otherwise, Metric units shall be used as measurement to Hull, Outfitting, Machinery, Spare parts and electrical installation.

1.2 General Descriptions

The vessel is to be designed and built as a non-propulsion steel vessel, the aft two rudder propellers to be used as assistance during transit of vessel or low speed and short distance movement during lifting operations.

The vessel is barge type, round bilge with bilge keel, the 4500t lifting capacity revolving crane to be located aft, the accommodation and helicopter deck to be fitted at fore part of vessel.

The maximum lifting capacity of crane is 4500t/37m during boom fixed at aft and 3000t/39m during boom at full revolving.

The vessel shall be mainly used to lifting and installation of offshore facilities, bridge modules.

The vessel can towage transit and operate in unrestricted navigating space. The lifting operation is described as below:

Water Depth:	8~300m
Height of Wave	abt. 2.5m
Wind Velocity	17.1m/s (Beaufort Class 7)
Current velocity	3.0kn
Ambient temperature	-20℃~45℃
Aft lifting 4500t	Trim angle 1.5°, Heel angle 1.5°
Full Revolving 3000t	Trim angle 1.5°, Heel angle 3.5°
Transit	Pitching 10°, Rolling 20°

All machinery and equipment can be worked under the following conditions:

Ambient temperature -20℃~45℃

Sea Water temperature 0℃~32℃

1.3 Main Particulars

Length Overall L_{OA}178.00m
 Length Between Waterline L_{WL}175.40m
 Breadth Moulded B48.00m
 Depth Moulded D17.00m
 Maximum Working Draught11.5m
 Maximum Transit Draught8.65m
 Number of Crews108
 Number of Special Personnel192
 Displacement during lifting Δ 88606.00t
 Displacement during transit Δ 65257.37t
 Coefficient C_B (without appendage)0.883
 Endurance 60 days

Performance of Lifting crane:

Main Hook fixed at aft 4500t×37m
 Main Hook revolving 3000t×39m
 Auxiliary Hook.....900t
 Small Hook.....160t
 Rigging Hook50t

Height Between Decks: (at centerline)

Main deck-----A deck3.40m
 A Deck-----B Deck3.20m
 B Deck-----C Deck3.00m
 C Deck-----D Deck2.80m
 D Deck-----Navigation Deck.....2.95m
 Navigation deck-----Compass Deck.....3.10m
 Sheer 0mm
 Camber 0mm

Frame spacing..... 700mm

1.4 Class, Rules, Regulations and Certificates

The vessel is to be registered in China or similar country at the owner's option on condition that specification is not to be changed.

The vessel is to comply with the requirements of the following rules and regulations applicable to a vessel of this type and size:

1. 《The Code of Safety for Special Purpose Ships》 IMO MSC.A534(13) and MSC/Circ446, MSC/Circ.478 and MSC/Circ.739.
2. CCS 《Steel Vessel Rules》 2009
3. CCS 《Rules for Lifting Appliances of Ships and Offshore Installations》
4. Marine Laws and Regulations of government of the ship's Flag
5. International Load Line convention (ILLC), 1966 and amendment.
6. International Regulation for Prevention of Collision at Sea, 1972 and amendments.
7. International convention for prevention of Pollution from ships, 1973 and protocol of 1978 with latest amendments.
8. Protocol for Marpol 73/78 annex VI; regulation for prevention of Air pollution from ships – Nox emission control.
9. Compliance with Marpol for Air Pollution Prevention
10. International Regulations for Tonnage Measurement of Ship, 1969
11. ISO 6954-1984 (E), Guidelines for Overall Evaluation of Vibration in Merchant ship
12. IMO Resolution A468 (XII), Code on Noise Levels on Board Ships
13. IMO Resolution MSC.267 (85) – Adoption of The International Code on Intact Stability,2008
14. CAP437 for Helicopter Facilities

The vessel shall class to CCS and is certified the following classification notations:

★CSA Floating Crane, Ice Class B, Lifting Appliance, Non Propulsion, Loading Computer (S,I,D), Helicopter Facilities

The full term certificates or provisional certificates indicated in this clause are to be furnished to the Owner at the delivery of the vessel.

If full term certificates cannot be obtained at the ship's delivery, the Builder is to furnish provisional certificate(s) to the Owner, which substitutes for the full term certificate(s). However, Builder to provide Owner with all full term certificates as soon as they are received

but within three months of delivery.

The following is to be issued by the Classification Society (without any “condition of class”).

- 1) Classification certificate of hull and machinery
- 2) Special Purpose Vessel Certificate (SPS Certificate)
- 3) International load line certificate
- 4) International tonnage certificate
- 5) Certificate for deck cranes and associated loose fittings
- 6) Classification certificate for machinery (including windlass, mooring winches)
- 7) Anchor and Chain Certificate
- 8) Statement of compliance with MARPOL '73 & PROTOCOL '78
- 9) MARPOL Annex VI on International Air Pollution Prevention, IAPP certificate
- 10) Loading computer certificate
- 11) Certificate for compasses, lanterns, nautical equipment, safety equipment
- 12) Builder’s certificate of hull and machinery
- 13) Asbestos free construction certificates

Other necessary certificate deemed by Class, which is not listed above shall be also provided to owner.

1.5 General Arrangement

The vessel is to be constructed with one complete continuous freeboard deck with forecastle deck. 4500t full revolving crane is located aft. The nine (9) watertight compartments to be divided by eight (8) plane transverse watertight bulkheads. Fore peak tank located forward of collision bulkhead and below main deck, it served as water ballasting tank as well.

The layout of vessel shall be as below:

A、Double bottom (beneath)

Double bottom to be arranged inner side of shell side tank, under engine room and other area except fore and aft peak tanks and are divided into port and starboard tanks by central water tight girder.

Double bottom tanks shall include: Water ballast tanks, Ballast pump tank, Fuel oil Overflow tank, Lubrication oil tank, Bilge tank, Sewage tank, Dirty water tank, Dirty oil tank, sludge tank, log room, echo sounder room, etc.

B、Tank top to Tween deck

The following tank or room to be arranged between tank top and tween deck: Aft propeller

tanks, Aft void tank, Water ballasting tank, Ballast pump tank, Engine room, etc.

The side tanks shall include Water ballast tank, Drinkable water tank and fresh water tank.

C、Tween deck

Positioning winch tanks are located at both end of the tween deck (aft end and fore end), while air conditioning unit room, refrigerator room, provision room, vegetable room, frozen food room, gymnasium are located at fore-middle part.

D、ABL13000 platform

Accommodation area: four (4) men's living unit (mainly for serving personnel) as well the serving facilities, such as dining room, galley house, toilet, bathing room etc.

E、Main deck

The main deck is complete continuous freeboard deck, 4500t lifting capacity revolving crane to be located aft main deck. Acetylene room, oxygen room, lamps and lanterns room, paint store, hydraulic pump room, CO₂ room, deck store to be arranged in the column crane pedestal. Aft mooring fairlead, roller etc are arranged aft main deck starboard and port side. Such mooring system shall be used to position the vessel before lifting operation.

The midship part of main deck is arranged as cargo loading area, the uniform deck load is 10t/m². Two cranes with capacity 15t × 25m are located at portside on main deck in order to lifting deck cargoes and accommodation goods. Boom hoist support and crane hook house located at starboard side.

The fore part of main deck to be mainly accommodation area, the following service spaces to be arranged: four (4) men's living unit, Laundry and iron room, toilet, bathing room, changing room, linen store, deck store, air conditioning unit room, Emergency generator room, sickbay etc.

F、A-Deck

A deck is in the forecastle, the following accommodation facilities to be arranged: four (4) men's living unit, one (1) men's living unit, air conditioning unit room, Laundry and iron room, toilet, bathing room, changing room, linen store, deck store etc.

Storage house and positioning anchor equipment area to be located at fore part of A deck.

G、B-Deck

B deck is above forecastle deck, accommodation facilities to be arranged at the aft part: two (2) men's living unit (with toilet unit), four (4) men's living unit, air conditioning unit room, Laundry and iron room, conference room, engineering office, electrical office, data library, deck store etc. The fore part arranged mooring facilities, such as anchor winch, mooring winch, fairlead, bollard etc.

H、C-Deck

Both office area and accommodation facilities are arranged on C-deck: owner's office, project office, conference office as well as one (1) man's living unit (with toilet unit), two (2) men's living unit (with toilet unit), air conditioning unit room, Laundry and iron room, linen

store etc.

I、 D-Deck

Senior officers serving facilities to be arranged on this deck: Conference office, Captain Office and living room, Chief engineer office and living room, Engineering superintendent office and living room, Client representative office and living room, one (1) man's living unit, Laundry and iron room Laundry, linen store, Battery and charging room, air conditioning room etc. Every habitation room on this deck equipped with toilet unit.

J、 Navigation deck

Navigation & Control room, conference Room (used as meeting room also), Electrical store room to be arranged.

K、 Compass deck

Radar, Arena, Search lights, signal lights, ship name board and mast to be fitted on this deck.

1.6 Main Machinery

The main machinery shall have certificates from CCS.

1.6.1 Main Generator Sets

Three (3) sets main generators shall be provided, main parameters are :

Rated Output.....	3380KW
Rated Revolution	600Rpm
Voltage and Frequency	6600V, 50HZ
Diesel Engine Output	3552KW
Diesel Engine Revolution.....	600Rpm

1.6.2 Harbor Diesel Generator

Two (2) sets harbor generators shall be provided, main parameters are :

Rated Output.....	880KW
Rated Revolution	750Rpm
Voltage and Frequency	400V, 50HZ
Diesel Engine Output	1080KW
Diesel Engine Revolution.....	750Rpm

1.6.3 Emergency Diesel Generator

One (1) set emergency generators shall be provided, main parameters are :

Rated Output..... 200KW
 Rated Revolution 1500Rpm
 Voltage and Frequency 400V, 50HZ
 Diesel Engine Output 231KW
 Diesel Engine Revolution..... 1500Rpm

1.6.4 Steering Oar

Driven by FPP, 360 degree revolving
 Output..... 2200KW
 Revolution..... 1000 r/min
 Diameter 2400mm

1.6.5 Bow thruster

Driven by frequency conversion motor
 Output..... 2000KW
 Revolution..... 980 r/min
 Diameter..... 2750mm
 Thrust..... 330KN

1.7 Main Deck Machinery

Two (2) sets sailing anchor to be arranged on both portside and starboard side at fore part, which each set consist of anchor, anchor chain, chain stopper, hawse pipe and one set single side hydraulic anchoring & mooring motor.

The vessel to be arranged twelve (12) sets working anchors. The working anchor tanks located in side tanks at aft end & fore end above tween deck, with three (3) sets working anchor in each tank.

The working anchor chain connects working anchor and positioning anchor winch through guide sheave.

The fore working anchor kept on anchor rack which is fitted overside, while the aft working anchor kept on anchor rack which is fitted on both sides of main deck.

1.8 Helicopter Deck

The helideck to be located fore part of vessel, partly on top of accommodation and suitable for operation for SIKORSKY S61-N, the helideck shall be designed, fabricated and marked according to latest CAP437 and China Civil Aviation rules for helicopter.

The helideck to be eight square type with a circle of 22.3m diameter inside, obstruction

free zone to be 210°.

The deck markings should be included: boundary line, target circle and marking letter “H”, vessel name etc. The deck should be installed boundary lights, spot light for helicopter taking off and touching down safely.

The Deck will be surrounded by a drain gutter and a safety net with 1.5m high. The gutter connected to oily water tank.

Two (2) inclined ladders to be fitted between helicopter deck and navigation deck.

The deck equipped with non-slip painted surface, a landing net, recessed tie-down points, wind socks etc. in accordance with the requirements relevant rules.

1.9 Tank Capacity

The vessel contains various type tanks separated by eight (8) transverse water tight bulkheads, two (2) longitudinal water tight bulkheads and central longitudinal bulkhead. The tanks are fore peak ballasting tank, bow thruster tank, No.1~No.4 ballasting tanks (P/C/S), No.5~No.6 ballasting tanks (P/C/S), drinkable water tanks (P/S), fresh water tanks (P/S), No.9~No.10 ballasting tanks (below double bottom), No.11~No.12 ballasting tanks (P/S), central engine room (lubricated oil tank, lubricated and dirty oil tank, bilge water tank, fuel and dirty oil tank etc.), No.13~No.14 ballasting tanks (P, S), ballasting pump tank (C), No.15~No.16 ballasting tanks (P/S), No.1~No.2 fuel tanks (C), No.17~No.20 ballasting tanks (P/C/S), No.21~No.24 ballasting tanks (P/C/S), No.25~No.28 ballasting tanks (P/C/S), aft steering oar tanks (P, S), void tank (C) and aft/fore positioning winch tanks.

The liquid tanks described as follows:

Fresh Water Tanks

Fresh water Tank (P/S)	2×1586.11 m ³
Total	3172.22 m ³

Drinkable Water Tanks

Drinkable Water Tank (P/S)	2×1586.11 m ³
Total	3172.22 m ³

Fuel Oil Tanks

No.1 Fuel Oil Tank	1735.08 m ³
No.2 Fuel Oil Tank.....	1735.08 m ³
No.1 Fuel Service Tank	21.69 m ³
No.2 Fuel Service Tank	32.53 m ³
Fuel Oil Overflow Tank.....	29.05 m ³
Fuel Oil Drain Tank	39.21 m ³

Fuel Oil Settling Tank..... 38.73 m³

Total..... 3631.37 m³

Lubricated Oil Tank

No.1 Lub Oil Storage Tank..... 138.14 m³

No.1 Lub Oil Circulation Tank(P/S)..... 2×6.39 m³

No.2 Lub Oil Circulation Tank..... 6.39 m³

Lub Oil Drain Tank..... 29.05 m³

Purified Lub Oil Tank 13.94 m³

Lub Oil Separator Tank(P)..... 9.30 m³

Special Purpose Tanks

Dirty Water Tank 374.74 m³

Sludge Tank 13.56 m³

No.1 Sewage Tank..... 62.55 m³

No.2 Sewage Tank..... 62.55 m³

Bilge Tank..... 40.67 m³

Fuel Dirty Oil Tank..... 114.63 m³

Lub Dirty Oil Tank..... 26.14 m³

Water Ballast Tanks

Fore Water Ballast Tank 2995.01 m³

No.1 Water ballast Tank..... 1814.76 m³

No.2 Water ballast Tank..... 1814.76 m³

No.3 Water ballast Tank..... 1280.15 m³

No.4 Water ballast Tank..... 1280.15 m³

No.5 Water ballast Tank..... 2336.22 m³

No.6 Water ballast Tank..... 2801.03 m³

No.7 Water ballast Tank..... 2600.31 m³

No.8 Water ballast Tank..... 2600.31 m³

No.9 Water ballast Tank..... 457.43 m³

No.10 Water ballast Tank..... 487.99 m³

No.11 Water ballast Tank..... 2448.20 m³

No.12 Water ballast Tank..... 2448.20 m³

No.13 Water ballast Tank.....	2498.37 m ³
No.14 Water ballast Tank.....	2498.37 m ³
No.15 Water ballast Tank.....	2643.47 m ³
No.16 Water ballast Tank.....	2643.37 m ³
No.17 Water ballast Tank.....	2721.41 m ³
No.18 Water ballast Tank.....	2721.41 m ³
No.19 Water ballast Tank.....	1809.80 m ³
No.20 Water ballast Tank.....	1809.80 m ³
No.21 Water ballast Tank.....	2575.42 m ³
No.22 Water ballast Tank.....	2575.42 m ³
No.23 Water ballast Tank.....	1508.17 m ³
No.24 Water ballast Tank.....	1508.17 m ³
No.25 Water ballast Tank.....	3828.30 m ³
No.26 Water ballast Tank.....	3828.30 m ³
No.27 Water ballast Tank.....	2219.40 m ³
No.28 Water ballast Tank.....	2219.40 m ³
Total	61697.77 m ³

1.10 Tonnage

The gross tonnage is about 46377; net tonnage is about 13913. The accurate gross tonnage and net tonnage will be indicated in CCS certificate.

1.11 Maneuverability

The vessel provides two (2) electric-driven (2200kW) steering oar with 360° revolving aft and one bow tunnel thruster (2000kW). Thus the vessel gets good maneuverability with short distance self-run & self-positioning. In sea trial with calm water condition, short distance speed is about 5.0kn.

1.12 Freeboard and Stability

1.12.1、Freeboard

The vessel is to comply with the requirements for type “B” ships defined by the International Convention on Load Lines, 1966.

1.12.2、Intact Stability

The intact stability under lift operation shall be carried out in accordance with CCS "Steel Vessel Rules 2009".

The intact stability under transit conditions shall be carried out in accordance with IMO Res MSC267(85) "2008 IS Code".

The lightship weight distribution with trim and stability calculation for the loaded conditions for typical transit and operation of the vessel including following with the provisional information of capacities of tanks:

- ※ Light ship
- ※ Full Loaded Transit Departure/Arrival
- ※ Ice Accretion Correction
- ※ 4500t×37m Aft lift Before or in Operation(100% and 10% Consumptions)
- ※ 4500t×30m Aft lift Before or in Operation(100% and 10% Consumptions)
- ※ 3000t×39m Rotary lift Before or in Operation(100% and 10% Consumptions)

For each calculation, bunker and other consumable supplies are presumed as follows:

At departure : Full supplies
At arrival : Approx. 10 % supplies

The vessel can transit and operate for unrestricted worldwide service.

As reinforcements of the flat bottom forward area to be not considered, the minimum forward draught for each loading conditions shall be taken to not less than 7.00m, which is not less than 0.04L.

The heeling and trim angle are not to produce in the lifting operation greater than required by crane manufacturer, maximum heeling angle is 3.5°; trim angle is 1.5°.

1.12.3、Damage Stability

The damage stability to be conducted as per requirements of 《The Code of Safety for Special Purpose Ships》 IMO Res A534(13) and It's revisions.

1.13 Noise

The noise should be match the following criteria when lasting full revolution conditions.

Wheelhouse	≤65 dB (A)
Cabin and Office area	≤60 dB (A)
Engine control room	≤80 dB (A)

1.14 Inspection & Quality Control

The Vessel shall be constructed and equipped accordance to relevant rules of Chinese

Shipbuilding Standard(CSQS-2005) and under the supervision of the Classification Society's Surveyor and the Owner's representative in compliance with the Builder's construction schedule.

Shipyard shall always ensure and maintain permanent cleanliness and safety on board throughout the construction period. Classification Society's Surveyor and the Owner's representative have rights to inspect materials and equipment.

All welding works should be carried out by qualified workers and the workers' certificate should be submitted for approval.

In case that opinion about the results of supervisions cannot come to an agreement between the Owner's representative and the Builder's Inspector, they shall confer together with the Classification Society's Surveyor and the designer.

The shipbuilder should provide quality control system to ensure work quality prior Classification Society's Surveyor and the Owner's representative inspection.

Main equipment should be checked by Classification Society's Surveyor and the Owner's representative before leaving factory.

Structures, equipment installation, equipment test should be checked by Classification Society's Surveyor and the Owner's representative according to relevant regulations.

1.15 Materials and Workmanship

Type, sizes and materials of structure, equipment and machinery are to be in accordance with Chinese Industrial Standard(GBM) and / or other equivalent foreign Industrial Standards.

The materials of main hull and superstructure to be approved by CCS and material certificate should be provided.

Any item accidentally and physically damaged is to be removed and renewed to satisfy Classification Society's Surveyor and the Owner's representative requirement.

Welding should be carried out by qualified workers with certificate and welding procedure should be approved by Classification Society's Surveyor and the Owner's representative.

Structure stress concentration should avoid as best as possible, correction method should be taken where applicable.

Welding defect should be removed and repaired according to shipyard's practice. Classification Society's Surveyor and the Owner's representative can be reject any items caused by welding in any stage before delivery in any situations.

Mold line should be kept faired during construction and members should be fitted align according to builder's standard and international shipbuilding practices.

1.16 Plan

1.16.1、 Approval Drawing

All plans required by Class should be submitted for approval.

One (1) copy of all approval drawing will be sent by e-mail in electronic-format to owner. If designer does not receive the Owner's reply to the plan within three (3) days including mailing time by courier mail, they are to be regarded as approved by the Owner without any comments. Owner's comments should not be against Class's comments and the special requirement should be approved by Class if applicable.

1.16.2、 Shop Drawings

Shop drawings shall be prepared by builder and suitable for builder's building procedures and workmanship.

The Builder's standard plans and the subcontractor's or the manufacturer's plans may be used as working plans for approval.

1.16.3、 As-Built Plan

At the time of delivery of the Vessel, the Builder or designer shall furnish to the Owner with three (6) copies of each finished plan and three (6) copies of each instruction book.

The plans prepared by builder should be submitted in one (1) month (according to Class requirement).

1.16.4、 Framed Drawings

Following plans, one (1) copy each, mounted in the frames with glass shall be installed abroad the Vessel in location designated by the Owner's representative:

- General Arrangement
- Capacity Plan
- Fire Control Plan
- Diagram of Pipeline System for ballast, bilge fire extinguishing etc.

1.16.5、 Vessel Photo

Three (3) framed vessel photos to be provided when construction complete.

1.17 Hull Mold Lines

Builder should try their best to ensure finished hull mold lines to be identical with lines plan and the main particulars also.

1.18 Launching and Docking

When main hull completed and tightness test is passed, launching can be held. Launching and its procedure should be approved by Classification Society's Surveyor and the Owner's representative in advance.

In case hull damaged during launching or after, whether sure or not, the vessel should be repaired in dock.

1.19 Test and Trial

1.19.1、 General

Tests and trials shall be conducted in accordance with the requirements of the Classification Society and other regulatory bodies and the marine practice. The checking items should be including: structure, outfitting, machinery and equipment.

When mooring trial passed, trial then can be conducted. The Builder shall submit to the Owner and/or Class the detailed schedule or memorandum for the test items mentioned hereinafter ten (10) days in advance prior to those tests.

The builder should prepare necessary tools or equipment for those tests.

All tests should be conducted according to test program which have been approved by Class. All results to be recorded and presented to the owner and Class surveyors.

1.19.2、 Tightness test

All steel structure to be inspected and tightness to be tested for tanks, bulkheads and superstructure deck and other wet space etc. according to tightness test plan which is approved by Class.

Tightness of windows, doors, access hatches, etc. are to be tested by water hose. In general, the leak test is to be carried out by air using detergent soapy water on the building berth except shop fillet joints and erection butt joints where on-block air test and vacuum test can be done respectively.

1.19.3、 Mooring trial

When tightness test completed and launching succeeded, mooring trial should be carried out before sea trial. The builder should test all the machinery and equipment to ensure all the items to be in good working conditions. Mooring trial should keep propel system running at least two (2) hours, keep all serving equipment in working condition to test its function. All these tests should be conducted according to test program which have been approved by

Class and should be supervised by Classification Society's Surveyor and the Owner's representative.

Detail descriptions except for minor equipment of shop tests to be referred to respective Specifications.

1.19.4、Inclining Experiment

Upon completion except for minor items of work, inclining test of the Vessel shall be carried out by the Builder at the present of class surveyor and owner. The inclining test shall be carried out, after the light weight measurement, in the presence of the Owner and the Classification Society's Surveyor, and then the position of the centre of gravity of the Vessel in light condition shall be determined by the Builder's calculation based on the test results. Two times of inclining experiments shall be conducted which is before/after crane installation, through two times tests, the weight and center of gravity of the crane shall be determined.

The test procedure should strictly followed the test agenda which is approved by Class before.

The calculation of the light weight and deadweight shall be made by the Builder and verified by the Owner and then "light weight" and "deadweight" shall be determined.

The report of inclining experiment should be prepared by the builder/designer and submitted for approval by Classification Society's Surveyor.

The light weight should including the items listed below:

- (1) Vessel steel, machinery and electric equipment, other equipment and outfitting mentioned in regulations and contract. The items not mentioned in rule/contract, such as spare parts, consuming goods, equipment installed by screw, screw and their belongs, water and oil in pipe and tanks, not included. But the cooling water and oil for system running should be included in light weight.
- (2) The necessary water and oil used by auxiliary engine.

1.20 Sea trial (auxiliary propel system test)

1.20.1、General

When the vessel is substantially completed and mooring test passed, sea trial is to be carried out as described below.

Sea trial is to get necessary data of auxiliary propel system in order to maneuver efficiently.

Sea trial should be conducted following approved procedure and supervised by Classification Society's Surveyor and the Owner's representative.

The builder should organize the sea trial. The fuel should be marine type light diesel oil and lubricate oil should be confirmed by owner, these two type oil should match the manufacture's specification.

The builder should take the responsibility to collect the sea trial data and prepare the report which should be submitted to owner's representative.

The sea trial is to be carried out on towage transit condition.

The sea trial to be carried out in calm and deep water with wind/sea state not worse than Beaufort 3.

1.20.2、Steering test

The following test should be conducted upon auxiliary propel system in C.S.R. condition: ship speed test & course stability test.

1.20.3、Other Test at Sea

Other test including: anchoring test, generator startup test, functioning test of firefighting equipment, tests or adjustment of other electrical navigation equipment and instruments

1.20.4、Lifting Test

After on board test and final inclining experiment to be conducted, Lifting test for main crane shall be carried out as per approved procedure from Class and owner.

Part II: HULL STRUCTURE

2.1 General

The vessel shall be built of all steel welded construction with single deck, single hull, forecastle, superstructure and Heli-deck. Between main deck and bottom, three (3) longitudinal bulkhead and eight (8) transverse watertight bulkhead to be fitted. Beneath main deck, several platforms to be fitted. Between two side longitudinal bulkhead, double bottom to be fitted, while between side shell and side longitudinal bulkhead, single bottom to be fabricated.

The scantlings of the structural hull members are to be in accordance with the requirements of the stipulated Classification Society for a vessel which has the scantling draft of 13.0 meters.

The vessel to be designed as crane vessel serviced in unrestricted navigating space; the hull has sufficient strength, rigidity and certain safety margin.

The vessel structure should be fitted follow shipyard's practice and international standard. The welding works should try to use manual CO₂ and automatic CO₂.

Longitudinal frame system is used throughout the main hull except fore peak, all stiffeners on transverse bulkhead are to be fitted vertically; transverse web frames to be arranged every 4 frame space (2800mm), to support the longitudinal. Transverse frame system is used in fore peak and superstructure.

Longitudinal structure shall be kept continuous from stem to stern as far as possible.

Any members with curve should be fabricated well and cannot go to next stage without inspection.

Workman ship should be strictly followed to reduce internal stress and deformation. The tolerance should be in approved limitation.

The structural details such as drain hole, air hole, cutout and slots etc shall follow the CB*3184-83, CB*3182-83 and meet Classification Society requirements.

During construction technology hole can be opened on deck, platform, and bulkhead prior to get approval from Classification surveyors/owner's representative. The hole should be sealed well after work completion.

All shell opening, deck opening and BHD opening should have sufficient curve and give appropriate correction required.

The scantling members should be fitted correctly and keep continuousness, the ends should be connect with bracket to avoid stress harden point.

More attention should paid on structures transition.

All useless padeye should be removed without damage the existing structure.

Overlap welding should be prohibited on deck, shell and bulkhead butt joint.

2.2 Welding

The welding to be carried out according to the Builder's standard, according to the welding procedure and normal practice approved by the Classification Society.

All care to be taken to ensure sufficient pre-heating and use of portable heating arrangement for the welding rods.

All welding is to be of best practice in accordance with the Builder's standard. Welding is also to be carried out round the ends of all collars at scallops on webs for frames, longitudinals, stiffeners, etc. Where structural members pass through the boundary of tanks, generally a small scallop of suitable shape is to be cut in the member close to the boundary on both sides the compartment and carefully welded all round.

CO₂ welding to be applied as far as possible. Use of manual welding to be kept to minimum.

Welding area should be clean up to satisfy relevant requirements. The preparations of edges for welding and root gap are to be in accordance with approved procedure. All contaminants such as water, rust, oil, slag, dust, paint, etc. impairing the quality of the welding are to be removed before welding and may be subject to Class inspection before welding.

Double continuous fillet welding shall be applied to all areas below and including the Upper deck and all wet/exposed areas. Double continuous welding is to be applied to connections in exposed areas, tanks, in wet spaces, bathrooms and toilets of built-in steel plate, bulkheads in galley and pantries, steering gear room, chain lockers and structural members for upper deck and below. The other connections may be welded with intermittent welding in accordance with Builder's standard and class Rules.

The radiographic inspection and ultrasonic inspection is to be carried out for the cross joints of seam and butt of the upper deck, sheer strake, bilge strake, bottom plate, tank top, top strake and bottom of top side tank to the satisfaction of the Classification surveyors.

2.3 Hull material

All structure material to be marine type killed steel with CCS certificate. The general used material grade to be CCA-A, CCA-B, CCA-D and CCS-DH. Crane and its pedestal steel grade to be CCS-DH and CCS-EH. Steel pipe grade to be #20.

The welding material used, such as welding wire, welding rod and welding flux to be manufactured by qualified factory. The welding material to be adopted with steel class and welding area requirement.

2.4 Keel

A flat plate keel 18 mm thick, 2050mm wide to be arranged throughout the length.

2.5 Shell plate

The thickness of plating is to be in accordance with the requirements by the Classification Society and it is to be gradually tapered from the midship to the ends according to the requirements of the Classification Society.

Shell structure members to be arranged longitudinal including bottom plate, side shell plate and bilge keel plate.

The keel plate to be connected with stem appropriately.

Bilge keel is to be provided along the ship length in bilge area.

The transverse web frame to be formed by bottom floor, side shell web and deck web.

Discharging pipe should be fitted on bottom plate in each deep tank and void tank.

All shell plates to be welded structure, with bottom plates 18mm, bilge keel plates 18mm, side plates 16mm, sheer-strake 18mm,, except in ice reinforcement region, where bottom plate 20mm and side shell plates are 20mm.

All shell plates to be grade “B” except sheer strake to be grade “D”.

2.6 Deck plate

The uniform main deck load is 10t/m² while pedrail crane working area to be strengthen properly.

Deck plates to be arranged longitudinally without camber and sheer.

Deck stiffeners to be supported by transverse webs which space span to be 2800mm.

Main deck: deck plate 22mm (CCS-B), deck stringer 22mm (CCS-D), others 15mm.

Platform deck plate 10mm.

Tween deck plate 10/12mm.

Deck plates in way of the crane, winch, bitt and heave lift shall be strengthened by web beams, longitudinals or pads, which to be increased in thickness or use high tension steel.

2.7 Bulkheads

Eight (8) transverse watertight bulkheads to be fitted in main hull, from bottom to main deck, all BHDs to be plane bulkheads with vertical stiffeners welded.

One (1) central longitudinal BHD and two (2) longitudinal watertight BHDs (12600mm off center line) to be provided. The three (3) longitudinal BHDs to form both sides tanks, central engine room and pump tanks.

Scantling of bulkheads as follows:

Collision bulkhead:

Thickness 14/16mm

Stiffeners $\perp 12 \times 400/16 \times 100$ / $\perp 14 \times 500/20 \times 100$

Central Bulkhead:

Thickness 14mm

Stiffeners (aft-part transverse framed) HP220 \times 10 / HP300 \times 11

Stiffeners (mid-part longitudinal framed) HP220 \times 10 / HP260 \times 10
HP300 \times 11

Stiffeners (fore-part longitudinal framed) HP220 \times 10 / HP180 \times 10

Vertical web $\perp 12 \times 500/16 \times 150$ / $\perp 12 \times 650/20 \times 200$

Bulkhead 12600mm off centerline:

Thickness 14mm

Stiffeners (fore / mid) HP220 \times 10 / HP260 \times 10
HP300 \times 11

Stiffeners (aft) HP300 \times 11

Vertical web $\perp 15 \times 850/25 \times 250$ / $\perp 12 \times 650/20 \times 200$ / $\perp 15 \times 1100/25 \times 300$

Non Watertight bulkheads:

Thickness 10mm 12mm 14mm 16mm

Stiffeners (above platform) HP160 \times 8

Stiffeners (above tween deck) HP220 \times 10 / HP260 \times 10

Stiffeners (below tween deck) HP300 \times 11

Vertical web $\perp 10 \times 350/16 \times 100$ / $\perp 14 \times 600/20 \times 200$

$\perp 12 \times 400/16 \times 100$ / $\perp 14 \times 500/20 \times 150$

$\perp 14 \times 600/20 \times 200$ / $\perp 12 \times 450/15 \times 100$

Deep Tanks:

Thickness 12mm 14mm 16mm

Stiffeners (above platform) HP260 \times 10

Stiffeners (above tween deck) $\perp 12 \times 400/16 \times 100$

Stiffeners (below tween deck) $\perp 14 \times 500/20 \times 150$

2.8 Bottom structure

Bottom is to be built with longitudinal framing supported by transverse solid floors fitted at adequate spacing. Longitudinal girders are to be arranged at adequate spacing to match

Class requirements.

Single bottom structure:

Web frames $\perp 15/25 \times 250 / \perp 12/25 \times 300$ (side tank)

Girder $\perp 18/25 \times 250$

Bottom long'sls HP320 \times 13

Double bottom: Height 3000mm

Center girder 14mm 16mm

Side girder 12mm 14mm

Solid floor 12mm 14mm

Inner bottom 12mm 14mm

Bottom long'sls. HP320 \times 13

Inner bottom long'sls. HP320 \times 13

Inner bottom Web $\perp 15 \times 500/20 \times 250 / \perp 12 \times 650/20 \times 200$

2.9 Frame Structure

Frame Structure to be longitudinal frame system with web frames support at every 4 frame spaces. Web frame connect deck web through bracket.

Web frame $\perp 15 \times 850/20 \times 250 / \perp 15 \times 1300/25 \times 300$

Side long'sls HP320 \times 13

Fore peak frame HP320 \times 13

Fore peak long'sls HP320 \times 13

Ice-zone frame HP300 \times 11

2.10 Deck structure

Deck web to be arranged at the frame position which fitted with web frame. The deck web is supported by deck girder and column.

Web beam space of main deck is 2800mm.

Main deck:

Pillar II 2(20x400)/2(25x200) H12x400/2 (20x400)

Web beam $\perp 15 \times 1200/25 \times 300 / \perp 15 \times 1000/25 \times 300$
 $\perp 15 \times 750/25 \times 250$

Girder $\perp 18 \times 1000/25 \times 300 / \perp 15 \times 750/25 \times 250$

Long'sls HP320×13 / HP300×11

Platform (13000 ABL):

Pillar H15×400 / 2 (25×400)

Web beam $\perp 12 \times 450 / 16 \times 200$

Girder $\perp 12 \times 450 / 16 \times 200$

Hatch web $\perp 15 \times 600 / 20 \times 250$

Hatch girder $\perp 15 \times 600 / 20 \times 250$

Long'sls HP180×10 / HP200×10

Tween deck:

Pillar H25×450 / 2 (25×400)

Web beam $\perp 12 \times 700 / 20 \times 200 / \perp 15 \times 1000 / 25 \times 300$

Girder $\perp 12 \times 800 / 20 \times 250$

Hatch web $\perp 12 \times 700 / 20 \times 200$

Hatch girder $\perp 12 \times 700 / 20 \times 200$

Long'sls HP180×10 / HP200×10

2.11 Superstructure and deckhouse

A forecastle deck and four tiers deckhouse above is to be arranged as indicated in the General Arrangement.

Forecastle structure:

Shell plate thickness 12mm

A Deck plate thickness 8mm

B Deck plate thickness 12mm

A deck beam L160x100x10

A deck web $\perp 10 \times 500 / 12 \times 150$

A deck girder $\perp 10 \times 500 / 12 \times 150$

B deck beam H300x11 / L180x110x10

B deck web $\perp 10 \times 500 / 12 \times 150$

B deck girder $\perp 10 \times 500 / 12 \times 150$

Deckhouse structure at first layer:

Thickness of deck 7mm

Thickness of front Wall	10mm
Thickness of other Walls	8mm
Stiffeners of front Wall	L125x80x8
Stiffeners of other Walls	L100x63x6
Deck girder	⊥ 8x300/10x100
Web beam	⊥ 8x300/10x100
Deck beam	L125x80x8

Deckhouse structure at second layer or higher:

Thickness of deck	7mm
Thickness of bulkhead	6mm
Stiffeners of Wall	L100x63x6
Deck girder	⊥ 8x300/10x100
Web beam	⊥ 8x300/10x100
Deck beam	L125x80x8

2.12 Helideck

The helideck to be located fore part of vessel, partly on top of accommodation. The helideck shall be designed, fabricated and marked according to latest CAP437 and China Civil Aviation rules for helicopter. The uniform load of heli-deck to be designed according to CCS rules.

The helideck to be eight square type with a circle of 22.3m diameter inside, obstruction free zone to be 210°.

2.13 Ice Class Strengthening

Ice strengthening design shall be as per Chinese Classification Society (CCS) of Class B. Half frame to be arranged in fore peak tank.

2.14 Foundation

The generator foundation to be welded structures with enough strength on inner bottom. Under inner bottom additional structure to be fit in line with the foundation for strengthen. Thickness of web plate to be 20mm while face plate to be 30mm.

The winch foundation to be welded structures on platform, which plate shall be increased in thickness, and strengthen structure to be arranged in accordance with the requirement of the rules.

2.15 Sea chest

Sea chests and overboard discharge fittings for the sea water service system are to be of steel plate.

The thickness of the plating forming the sea chests is to be in accordance with the requirement by the Classification Society but not less than adjacent shell.

2.16 Bilge keel

Intermittent bilge keel to be arranged in bilge area, which is constituted by flat bar and round bar.

The bilge keel welded onto bilge shell, the gap and the ends to be gradually tapered.

2.17 Bulwark

Steel bulwarks of about 1100mm high with top rails and stays are to be fitted to forecastle as indicated in the General Arrangement. Fixed handrail/removable handrail to be arranged at other area for protection, the height of handrail is 1000mm.

2.18 Skegs

Two Skegs to be arranged in the aft to improve stability and to protect aft structure in case of strand/docking.

The skegs shall be all welded structures, the outside plate to be 16mm with inside support plate to be 12mm.

2.19 Hull structure strengthen under the main crane

The hull structure under the main crane shall be designed to endure major bending moment and shear generate from crane operation.

Cylindrical pedestal with stiffeners shall be arranged to penetrate the main deck and terminate to bottom shell, which strengthened by additional longitudinal and transverse bulkheads inside and in line with main hull structures.

2.20 Local strengthen

Deck structures in way of the main boom rest and hook holders shall be local strengthened in accordance with the recommendation of main crane maker and requirements of class rules.

Strengthening of deck structures under the winch, Windlass, Mooring bitts and fairleaders etc. shall meet the requirement of the class rules

Part III: OUTFITTING

3.1. Anchor equipment

The anchor and mooring equipment are to be equipped according to the “Rules for Classification of Sea-going Steel Ships” (2009) of CCS. The weights of anchors are to be selected 2 grades above equipment number. All the anchors, anchor cable and mooring equipment are to be made of approved materials with CCS certificates.

Anchoring equipment

Two sets of anchor equipments are arranged on both sides of Forecastle deck. Each set of equipment is consisted of bower anchor, anchor chain, roller-type cable stopper, hawse pipe and one combined windlass. The windlass can be used to casting, retrieving anchor and also mooring.

Anchor: Three, AC-14 ,each 11025kg, one as spare.

Anchor chain: 742.5m Stud-link chain cable 95 mm in diameter grade AM3

13 shots for left chain and 14 shots for right chain.

Windlass: with one chain wheel, single gypsy, two mooring drums.

Working load: 428.96kN Supporting load: 2900kN

Drum load: 200kN Drum capacity: $\Phi 80 \times 200\text{m}$ (Fiber rope)

Mooring speed: 15 m/min Drum supporting load: 300kN

Gypsy load: 100kN

3.2. Mooring equipment

3.2.1 Mooring rope & Towing rope

Twelve mooring rope:

Six 8-Polymide rope, $\Phi 80\text{mm} \times 200\text{m}$, Minimum breaking load 1000kN.

Six steel wire rope, $\Phi 40\text{mm} \times 500\text{m}$, $6 \times 37 + \text{FC1570}$, Minimum breaking load 741kN.

3.2.2 100kN capstan

Four 100kN electrical driven capstans to be installed on both sides near the middle of the ship. The two capstans can work at the same time.

Rated pull: $100\text{kN} \times 12 \text{ m/min}$

DIA. SWR: $\Phi 40$

Supporting load: 150kN

3.2.2 200kN Multi-purpose Hydraulic winch

Two 200kN hydraulic winches are installed on both sides of the astern deck near the crane. The two winches can work at the same time.

Drum load:	200kN×15 m/min
Drum capacity:	200m×Φ500m DIA. SWR
Holding load:	600kN
Gypsy load:	100kN

3.2.3 200kN Multi-purpose electric winch

Four 200kN electronic winches are installed. Two are on both sides of the fore deck near the forecastle. The other two are on both sides of the astern deck near the crane.

Drum load:	200kN×15 m/min(1 st layer)
Drum capacity:	500m×Φ40 DIA. SWR
Holding load:	600kN
Gypsy load:	50kN

3.2.4 Public hydraulic pumping station

Two sets of hydraulic pumping stations, each can supply oil for one 200kN hydraulic winch and one 650kN hydraulic winch separately.

The two sets of hydraulic pumping stations are connected to each other and can be used as mutual backup.

The power system is A.C. 380V,50Hz.

3.3. Towing equipment

Towing equipments are equipped to satisfy towing speed of 6kn in still water. All the towing equipments are as follows:

Two towing brackets and two the closed chocks on the forecastle deck

One towing bitt at the center line of the hull with one towing chock

Two sets of towing bridles, Each set consists of two long chain, one triangle plate, one short steel rope, one shackle and retrieving rope.

One 15t reel winch on the forecastle deck. Retrieving rope can be pulling back by the winch when the triangle plate is connected to guiding pulley under the helicopter platform.

3.4. Position anchor equipments and Towing winch

3.4.1 Requirements

Position anchor equipments comply with **eight** points anchor mooring system. Four winch rooms are arranged on the port and starboard ship under the main deck for the winches. Two position anchor winches are installed in the aft winch rooms each. Three anchor winches are installed in the fore winch rooms each(one as spare). Anchor cables are lead to the main deck and forecastle deck with guiding sheave, lead off the ship through fairlead, and then connect

to the position anchors.

3.4.2 Anchor

Eight STEVPRIS MK5 anchor, each 12000 kg .

3.4.3 Anchor cable

Eight $\varnothing 76\text{mm} \times 2500\text{m}$ galvanized steel rope. 6×49 SWS + IWR, breaking load 3430kN. AM3 Anchor chain of $\varnothing 76\text{mm}$ connect anchor and anchor cable. The length of anchor chain is approximately 6m.

3.4.4 Position anchor winch and Towing winch

a. Ten electrical driven winches are installed to the ship(two to be installed later on). The winches can be controlled nearby and also in the wheelhouse.

Specification of the winch as follows:

Rated pull: 1100kN (8th layer)
 Speed: 0~15 m/min (when the pull is 1100kN)
 Light pull: 200kN (8rd layer)
 Speed: 0~125 m/min (when the pull is 200kN)

Holding load(brake): 2320kN (2nd layer)
 Holding load(frame): $\leq 3800\text{kN}$ (2nd layer)
 Drum capacity: $\varnothing 76\text{mm} \times 2480\text{m}$

Other equipment to complete the set:

- 1) local control station;
- 2) remote control station in the wheelhouse;
- 3) Tension indicator of anchor cable;
- 4) Releasing Length indicator of anchor cable;
- 5) Releasing Speed indicator of anchor cable;

The brake and clutch of the anchor winch are hydraulic control. One hydraulic pump package is provided for each anchor winch.

b. Two hydraulic towing winches are installed at aft ship. The winches can be controlled nearby and also in the wheelhouse.

Specification of the winch as follows:

Rated pull: 650kN (4th layer)

Light pull: 60kN (4rd layer)
 Holding load: $\leq 1800\text{kN}$ (1st layer)
 Drum capacity: $\varnothing 60\text{mm} \times 1500\text{m}$

3.5. Mast & signal

A fore mast is arranged on the wheelhouse top. Mast light, red light, white light and radar are to be arranged on the mast.

Two lampposts are to be arranged on both sides of wheelhouse deck. Each has two red lights and two green lights;

Two sidelights are to be arranged on both sides of wheelhouse deck.

Two anchor lights to be arranged separately to aft ship and fore ship.

3.6. Crane

One 15t \times 26m crane to be installed on the port side of the main deck.

Two 12t \times 16m crane to be installed on both sides of forecastle deck.

One 15t \times 12m crane to be installed on the starboard side of the aft main deck.

3.7. Ladder, railing, manhole cover & hatch cover

3.7.1 Accommodation ladders

Two accommodation ladders with electric ladder winches are provided on both sides of fore ship.

3.7.2 Interior stairs

Stairs in living space and service space should be of steel and not less than 900mm in width and 45° in angle .

3.7.3 Exterior ladders

Inclined ladders outside deckhouse and leading to machinery space should be of steel and not less than 800mm in width. The inclined angle is normally 45° , but nor bigger than 55° .

3.7.4 Vertical ladder

Steel vertical ladders of 400mm width should be arranged on main deck, tweendeck, and in ballast tank, void, F.W. tank, oil tank, lubricant oil tank, dirty oil tank, etc.

3.7.5 Railing

Railing of $\varnothing 114 \times 6\text{mm}$ should be arranged on main deck. Railing of $\varnothing 42.25 \times 3.25$ should be arranged on each deck. The height of railing is 1000mm.

3.7.6 Handrail

Storm handrail is arranged in alleyway of the living space and service space.

3.7.7 Manhole cover

Manhole cover of watertight type or oil tight type should be arranged on main deck, tweendeck and in ballast tank, void, F.W. tank, oil tank, lubricant oil tank, dirty oil tank, and chain lockers, etc. Nut and bolt of covers should be of stainless steel.

3.7.8 Hatch cover

Weather tight hatch cover of 830X830mm should be arranged for pipe tunnel.

Watertight hatch covers of 2000X1800mm should be arranged for engine room.

Watertight hatch cover of 4400X4100mm should be arranged for steering gear room.

One weather tight hatch cover of 830X830mm should be arranged on deck B.

3.8. Door**3.8.1 Hydraulic sliding watertight door**

Hydraulic sliding watertight Doors are to be used between engine room & pump room on the double bottom, and between engine room and living space. Width of door is 700mm. The doors can be handled manually at both sides. The doors also can be shut down from the wheelhouse.

3.8.2 Steel doors

For the outside wall of the wheelhouse stainless steel sliding door of 750X1700mm to be used.

The doors leading to the open deck used the weathertight steel door; Width of door as main passage should not less than 800mm. Width of other doors is not less than 700mm.

3.8.3 Cabin' doors

Cabin's door should comply with the fire-resisting class of bulkheads wherein. Width of doors is 700~800mm.

Door of engine control room must be the steel soundproof airtight door. Width of the door is 800mm.

3.8.4 Other requirements

Weather tight steel door which lead to the deck should have door hook, sleeve and padlock.

Fireproof door of main stairway should have self-closing device, and remote release & shut device..

Second door into alley and cabin's door in 'B' class division should have self-closing device.

Door sills should be covered by stainless steel plate. Door sills of height above 380mm should have steps.

3.9. Windows

3.9.1 Windows of wheelhouse

Welding wheelhouse windows should be arranged around wheelhouse. Among which there are two electrical heating windows be arranged on fore bulkhead, also on aft bulkhead, right bulkhead and left bulkhead. All eight electrical heating windows have cross sliding type wiper. The window in the middle of fore bulkhead should have snow cleaner.

3.9.2 Scuttles

Welding scuttles of $\Phi 400$ mm deadlight with deadlight should be arranged below deck B.

3.9.3 Rectangular window

Welding rectangular windows of 400X560mm should be arranged on deck B, deck C, deck D.

3.9.4 Window of engine control room

Windows should be arranged for engine control room on the bulkhead face the machinery. The window should be aluminum alloy sound proof window. The number and size of the window can be decided according to the control console.

3.9.5 Fire resistance service window

Fire resistance service window of 1100x800mm should be arranged between galley and crew mess.

Fire resistance service window of 900x630mm should be arranged between the galley and officer mess, also between galley and VIP mess.

3.10. Fire fighting equipment

The fire precaution, fire extinguishing and fire fighting apparatus shall be provided in compliance with the <Statutory Survey Regulation of Ship and Marine Facility-- Statutory Survey Technical Regulation of International Navigation Sea-going Vessel>2008 and relevant amendments. Fire extinguisher, fireman outfit and emergency breathing appliance shall be provide in compliance with the convention.

Water fire-extinguishing system, CO₂ fire-extinguishing system, and foam fire-extinguishing system should refer to Part IV.

3.11. Life saving equipment

Life saving appliances shall be furnished completely in accordance with requirements to passenger ship of <Statutory Survey Regulation of Ship and Marine Facility-- Statutory Survey Technical Regulation of International Navigation Sea-going Vessel>2008 and

relevant amendments.

Each two closed life crafts are equipped on both sides of the B deck. The craft has capacity of 58 persons, gravity-type boat davit, electric life-saving/rescue boats winch. Two of the four life crafts can work as rescue boat.

One set of marine evacuation system is to be provided on each side of Deck B. The system is consisted of evacuation passage, embarking platform, gas-filled system and container. The system usually is folded up and kept in stainless watertight container.

Lifebuoys, lifejackets, immersion suits and etc is furnished in accordance with rules.

3.12.Working boat

One steel working boat with seat is provided on port side of main deck . The boat can work as traffic boat.

Main specification of the boat is as follows:

Length overall: approx. 9m

Power of main engine: approx. 88kW

3.13.Helideck

The Helideck is for SIKORSKY S61-N helicopter. Helideck is of octagon contain a dia. 22.2m circle. Obstacle-free area is of 210° .

Helideck marking includes perimeter line, aiming circle, 'H' and ship name, etc. Perimeter lights and helideck flood lights should be arranged to ensure the helicopter can land of off safely.

Perimeter safety netting of 1.5m width is to be arranged to ensure personnel safe.

Two inclined ladders are to be arranged away to each other connect wheelhouse deck and helideck.

Landing area net to be arranged to ensure the helicopter can land of off safely.

Tie-down equipments are to be arranged to securing the helicopter when at rest.

A wind direction indicator (windsock) should be provided and located so as to indicate the (clear) area wind conditions at the installation/vessel location.

Collecting annulus are to be arranged along the perimeter of helideck and to be connected to the sewage tank.

3.14.Elevator

One elevator is provided as General Arrangement Plan.

Main Specification:

Load capacity:	400kg
Speed:	0.63m/s
Inner Dimension:	Floor ~990×880mm
	Height ~2200mm

3.15.Fender

Tire fenders are to be arranged on both sides of the ship to prevent the ship from being damaged by other ship.

Four pneumatic rubber fenders of diameter not less than 2.5m should be arranged to both sides of main deck and the stern. Securing devices should be arranged to attach the fenders to the ship hull.

3.16.Painting and corrosion control

All the painting works should adopt paint products of high quality adapting to the circumstance. The type, specification, guarantee time, and also final color shall be approved by Buyer.

Cathodic protection for the underwater hull shall be provided with impressed current.

The sacrificial anodes shall be provided for ballast tanks and the sea chest and etc. Lifetime is 5 year.

3.17.Wood sheathing

Wood sheathing is provided on pipe piling area of the main deck. The wood is of 100mm thick, ~150mm wide, and 2400mm~3600mm long. The periphery of wood sheathing is secured by angle bar and the end of wood is secured by steel plate, stainless screw. Anti-corrosive treatment should be taken before installation of wood sheathing.

3.18.Supplies inventory

Supplies of the ship to be furnished according to ‘ Ocean going cargo ship deck fittings spare parts and supplies standard’, and also builder and buyer’s requirements. Details see Supplies Inventory.

3.19.Bottom plugs

Stainless bottom plugs are provided at the bottom of oil tanks.

3.20.Accommodation arrangement

3.20.1 Accommodation

The arrangement of accommodation to satisfy the requirements of 102 crew and 198 special personnel.

Accommodation for crew

1 man suite (with toilet unit)	1 (~25m2)
1 man suite(with toilet unit)	7 (~18m2)
1 man cabin(with toilet unit)	14(~11m2)
2 men cabin(with toilet unit)	20(~15m2)
4 men cabin	10(~15m2)

Accommodation for special personnel

1 man suite (with toilet unit)	3 (~18m2)
1 man cabin(with toilet unit)	7 (~11m2)
4 men cabin	47(~15m2)

3.20.2 Accommodation equipments

A. One man suite

For the office:

- 1 L type writing desk
- 1 book rack
- 1 high class upholstered revolving arm chair
- 1 turn angle corium sofa
- 1 coffee table
- 1 book case
- 1 refrigerator (with cabinet)
- 1 LCD TV
- 1 miniature acoustics
- 1 DVD
- 1 desk lamp
- 1 TV cabinet
- Coat hooks, etc.

For bedroom:

- 1 single bed (2000x1200)
- 1 bedside cabinet
- 1 double-door wardrobe
- 1 safety locker (only for captain)
- 1 desk lamp, etc

B. One man cabin

- 1 single bed (2000x1000)
- 1 bedside cabinet
- 1 double-door wardrobe
- 1 writing desk
- 1 swivel armchairs
- 1 book rack
- 1 coffee table
- 1 LCD TV
- 1 miniature acoustics
- 1 DVD
- 1 desk lamp
- 1 TV cabinet
- Coat hooks, etc.

C. Two men cabin

- 2 single bed (2000x900)
- 2 single-door wardrobes
- 1 writing desk
- 1 revolving arm chair
- 2 book rack
- 1 desk lamp
- Coat hooks, etc.

D. Four men cabin

- 2 double bunk (2000x800)
- 2 two-door wardrobes

- 1 writing desk
- 1 revolving arm chairs
- 3 folding chairs
- 4 book racks
- 1 washing basin
- 1 sofa
- 1 mirror box
- 1 desk lamp
- 1 towel rack
- Coat hooks, etc.

E. Hospital

- 1 sickbed(movable iron bed)
- 1 writing desk
- 1 revolving arm chairs
- 2 back-rest chairs
- 1 medicine cabinet
- 1 medical refrigerator
- 1 sterilization cabinet
- 1 stretcher
- 1 washing basin
- 1 exclusive use lamp
- Coat1 hooks, curtain,etc

F. Office

- L writing desk
- revolving arm chairs
- file cabinet, etc

G. Big conference room(50P)

- 1 conference table
- 28 high class upholstered arm chairs
- 8 upholstered sofas
- Resultant cabinet

- 1 LCD TV
- 1 acoustics
- 1 DVD
- 1 Drinking Water Fountain Cold/Hot
- 1 White Board
- 1 coffee table, etc.

H. Small conference room(12P) 3

- 1 conference table
- 12 arm chairs
- 1 LCD TV
- 1 acoustics
- 1 DVD
- 1 Drinking Water Fountain Cold/Hot
- 1 White Board

I. Gym

- 2 foldaway ping-pong tables
- 2 treadmills
- 2 mountain-climbing machines
- 2 boating machines
- 1 multifunctional body-building machine
- 2 sets of dumbbell
- 2 benches
- 1 resultant cabinet
- 1 acoustics
- 1 Drinking Water Fountain Cold/Hot , etc

J. Central control room

- 4 adjustable revolving fixed chairs
- 4 high class upholstered arm chairs
- 1 flag chest
- 1 chart table
- 2 telescope chests

-- 1 key box

-- 1 Drinking Water Fountain Cold/Hot , etc

Note: (1) The arrangement of equipments can be adjusted according to accommodation arrangement. The final proposal must be approved by Purchaser.

(2) 2 digital cameras and 1 video camera to be equipped to the ship.

(3) 2 portable projectors and movable curtains to be equipped to the conference rooms

(4) Garbage bins are to be equipped to each room. Thermos and rack to be equipped to room without drink machine.

3.20.3 Galley equipments

No.	Name	Quantity	Remarks
1.	Electric Cooking Range with 6 Oven ~ 28.8 kW	1	With 1 roaster
2.	Electromagnetic Range with 2 Oven ~9kW	1	
3.	Electric Tilting Frying Pan (40L) ~ 9 kW	3	
4.	Multi-purpose machine(50L) ~1.5kW	1	With Meat twisting head
5.	Dough Mixing Machine (20 kg powder) ~ 2.9kW	1	
6.	Baking Oven~8.1kW	2	double tiers, with ferment box
7.	Electric Fryer ~12KW 380V	2	With fire extinguisher
8.	Dish Washer (60 basket/h) ~18.5KW 3	2	
9.	Special Washing machine for galley cover cloth(5kg)	1	
10.	Sterilized Cabinet (350L) ~ 2.7 kW	2	
11.	Electric Tilting Soup Boiler (60L) ~9KW	2	
12.	Waste Disposer (15kg/min) ~1.5KW	1	
13.	Steam Box (42 kg) ~ 9kW	2	14 liters X6
14.	Food warming table(four divisions) ~4kW	1	
15.	Soy milk& Bean curd machine(150kg/hr)~10kW	1	
16.	Potato Peeler (15kg) ~0.75KW	1	
17.	Multi-functional Slicer ~0.25KW	1	

No.	Name	Quantity	Remarks
18.	Vegetable Cutter ~1KW	1	
19.	Noodle machine ~1.5kW	1	
20.	Electric Pan Cake Toaster ~4.5KW	2	
21.	Rice washing machine 25kg	1	
22.	Refrigerators 500L ~0.25KW	2	Refrigeration &Freezing
23.	Micro-wave Oven ~1.3KW	2	
24.	Rice cooker ~2.65kW		
25.	Stainless steel Double Sink Table	6	
26.	Stainless Working Table	5	
27.	Stainless Bowlrack	3	
28.	Stainless Bottle Rack	3	
29.	Stainless Cup Rack	3	
30.	Stainless Condiment Table	2	
31.	Stainless Chopping Table	5	
32.	Stainless Steel Trash Bin	1	
33.	Multi-purpose machine(40L) ~1.5kW	1	
34.	Catering table 1200x650x850	1	
35.	Bread Slicer ~0.25KW	1	
36.	Steamed bread machine 1.1kW	1	
37.	Dumpling machine 2.2kW	1	
38.	Ice Cube Machine ~0.8KW	1	
39.	Flour plate 1800x800x850	5	

3.20.4 Mess equipments

A. Officer mess

No.	Name	Quantity	Remarks
1.	Food insulation stage(4 frames) ~4kW	1	
2	Soybean milk machine ~2.2kW	1	
3	Soup barrel	1	

4	Rack 2500X600X850	1	
5	Cold drink machine 0.18kw	1	
6	Electric water boiler DF-60	1	
7	Televison	1	
8.	Dinning Table 2400X700X750	7	
9	Dinning Table 1200X700X750	1	
10	Dinning Table 1700X700X750	1	
11	Dinning chair 2200X300X450	14	
12	Dinning chair 1000X300X450	2	
13	Dinning chair 1500X300X450	2	

B. Vip mess(1)

No.	Name	Quantity	Remarks
1.	Rack 2000x400x850	1	
2.	Electric water boiler DF-30G	1	
3.	Dinning Table 3600X800X850	2	
4.	Dinning chair	24	

C. Vip mess(2)

No.	Name	Quantity	Remarks
1.	Rack 2000x400x850	1	
2.	Electric water boiler DF-30G	1	
3.	Dinning Table 3600X800X850	2	
4.	Dinning chair	24	

D.Crew Mess

No.	Name	Quantity	Remarks
1.	Insulation Table (4 frames) ~ 4 kW	2	
2.	Rack 2500x600x850	1	
3	Soybean milk machine ~2.2kW	1	

4	Soap barrel	1	
5.	Cold drink machine 0.18kW	1	
6.	Electric Water Boiler (42L)	1	
7	TV	2	
8	Dinning table 2400x700x750	11	
9	Dinning table 1200x700x750	2	
10	Dinning table 1700x700x750	5	
11	Dinning table 3400x700x750	3	
12	Dinning table 2900x700x750	1	
13	Bench 2200x300x450	22	
14	Bench 1000x300x450	4	
15	Bench 1500x300x450	10	
16	Bench 3200x300x450	6	
17	Bench 2700x300x450	2	

3.20.5 Toilet unit

Sanitary appliances and other accessory of sanitary unit can be equipped as follows(unit of captain room and supervisor room have bathtub):

No.	Name	Quantity	Remarks
1.	Water closet	1	vitreous china wall hang with open seat & flush valve type w.c .and Insulation water box
2.	Artificial marble mesa (800X500) with Washbasin	1	With 1set faucet, S-type trap, pipe, valve stainless steel painted apron board and rack
3.	Shower and accessory	1	chrome plated brass ,With thermostatic mixing valve, hose、sprinkler, etc.
4.	Mirror case or two tiers rack	1	With 18~20W lamp, socket (220V) , chrome plated brass, glass
5.	Mirror	1	anti-mist face, With mirror lamp
6.	Soap rack	2 or 4	Stainless steel
7.	Stormrail	2	Stainless steel or chrome plated brass
8.	Toilet paper rack	1	Stainless steel or chrome plated brass

No.	Name	Quantity	Remarks
9.	Multi-layer towel rack	1, 2, 4	Stainless steel or chrome plated brass
10.	Brush and seat	1	Stainless steel or chrome plated brass
11.	Door holder	1	Stainless steel
12.	Clothing-hanging rope	1	Assembly
13.	Clothing-hanging hook	2 or 4	Stainless steel
14.	Shower curtain and accessory	1	
15.	Rubber anti-slip cushion	1	
16.	Buzzer (or speaker)	1	
17.	Exhaust valve	1	

3.20.6 Washroom

Sanitary appliances of public toilets can be equipped as follows:

No.	Name	Quantity	Remarks
1.	Water closet	35	With flashing valve
2.	Urinal	26	With flashing valve
3.	Artificial marble mesa (800X500) with Washbasin	10	With 1set faucet, S-type trap, pipe, valve stainless steel painted apron board and rack
4.	Mirror	8	GRP lace
5.	Soapbox	8	Stainless steel or chrome plated brass
6.	handrails	35	Stainless steel or chrome plated brass
7.	Toilet paper holder	35	Stainless steel or chrome plated brass
8.	Sink	6	With 1set faucet, pipe, valve
9.	Hat and coat hook	70	Stainless steel or chrome plated brass

3.20.7 Bathroom

Equipments of bathroom can be equipped as follows:

No.	Name	Quantity	Remarks
1.	Artificial marble mesa (800X500) with Washbasin	12	With 1set faucet, S-type trap, pipe, valve, stainless steel painted apron board and rack

2.	Shower and accessory	48	chrome plated brass ,With thermostatic mixing valve, hose、sprinkler, etc.
3.	Mirror	12	GRP lace, water-fog proof
4.	Soap box	60	Stainless steel or chrome plated brass
5.	handrails	50	Stainless steel or chrome plated brass
6.	Multi-layer towel hanger	12	Stainless steel or chrome plated brass
7.	Towel hook	96	Stainless steel or chrome plated brass
8.	Bench	6	Wooden
9.	2-door Wardrobe	4	Stainless steel
10.	3-door Wardrobe	7	Stainless steel
11.	Hat and coat hook	4	Stainless steel or chrome plated brass

3.20.8 Laundry & Dry room

Equipments of laundry & dry room can be equipped as follows: :

No.	Name	Quantity	Remarks
1	Washing chamfer	4	With thermostatic mixing valve, S-type trap
2.	washing machine	10	market
3.	Dryer	6	market
4.	Dryer Ark	5	
5	Others		

3.20.9 Changing room

Wardrobes are equipped to the changing room.

3.20.10 Store and tool store

Store cabinets and racks is equipped to the store and tool store.

3.21.Insulation

All the exposed roof and outer bulkhead in accommodation to be insulated with rock wool. 100mm thick for deck and 50mm thick for bulkhead.

Ceramic wool to be used to satisfy the fire resisting class.

All insulation material to be fixed by bump nails.

3.22.Lining

The lining, independent plate, ceiling of wheelhouse, engine control room, living room, public space (mess room, conference, etc), passage to be rock wool compounding plate. The lining of the galley to be covered of single stainless steel plate layer The lining, ceiling of other spaces to be PVC laminated rock wool plate. The lining to be of 25mm single face PVC laminated rock wool plate, and the independent plate to be 50mm double face PVC laminated rock wool plate. The lining and ceiling of toilet and bathroom are to be GRP plate.

3.23.Deck covering

Wood sheathing to be equipped to crane working area on main deck.

The floor of wheelhouse, living cabin, public space(mess, conference, etc), store of articles of daily use and interior passage ,etc, to be covered with fire retardant deck covering, and then PVC.

The floor is to be covered with cement and anti-slip tiles in the damping space such as galley, bathroom and toilets. The bulkheads of these places are to be covered with tiles 300mm above floor.

Part IV: MACHINERY

4.1 General description

The vessel is large, non-propulsion, all-welded, steel floating crane vessel. Its stem is to be designed as streamline, and there is arc at stern portrait and bilge with bilge keel. The accommodation and helicopter deck is to be fitted at fore part of vessel. A revolving crane is to be located aft, and the maximum lifting capacity of crane are 4500t×37m during boom fixed at aft and 3000t×39m during boom at full revolving. The fore one (1) tunnel bow thruster and aft two (2) rudder propellers is to be used as assistance.

The vessel shall be mainly used to lifting and installation of ocean engineering, offshore facilities, bridge modules, etc.

Maneuver navigation limit: unrestricted navigation

Working navigation limit: unrestricted navigation

The vessel is to be designed and built as the following rules and regulations: Annex IV' The Code of Safety for Special Purpose Ships (SPS)' of 'Statutory Survey Regulation of Ship and Marine Facility- Technical Regulations for the Statutory Surveys of International Navigation Sea-going Ships2008', CCS 'Rules for the Classification of Sea-going Steel Ships 2009' (abbr. the rule), Maritime Safety Administration of the P. R. China' Statutory Survey Regulation of Ship and Marine Facility(international 2008 and domestic 2004)' and CCS《Rules for Lifting Appliances of Ships and Offshore Installations》.

Ambient conditions:

All main equipments and accessory can just work at following design conditions.

Ambient air temperature: 45℃

Sea water temperature: 32℃

Atmospheric pressure: 0.1MPa

Relative humidity: 80%

Fuel oil requirement: 0 # or -10 # diesel oil

Engine control room is to be set in engine room, someone on duty to monitor the electromechanical equipments.

4.2 Main power equipment

4.2.1. Generator set equipment

Main generator set

Number: 3

Rating power: 3380 kW

Rating rotation speed: 600 r/min

Electric power: 6600V, 50Hz, 3φ

Diesel engine:

Type: in-line, 4-stroke, turbo-charged, direct injection, inter-cooling, non-reversible

Model: 8G32

Rating power: 3552 kW

Rating rotation speed: 600 r/min

Starting type: compressed air

Cooling type: closed cycle of high and low cooling water

Harbor generator set

Number: 2

Rating power: 880 kW

Rating rotation speed: 750 r/min

Electric power: 400V, 50Hz, 3φ

Diesel engine:

Type: in-line, 4-stroke, turbo-charged, direct injection, inter-cooling, non-reversible

Model: 8230ZD

Rating power: 1080 kW

Rating rotation speed: 750 r/min

Starting type: compressed air

Cooling type: closed cycle water cooling

Emergency generator set

Number: 1

Rating power: 200 kW

Rating rotation speed: 1500 r/min

Electric power: 400V, 50Hz, 3φ

Diesel engine:

Type: in-line, 4-stroke, turbo-charged, direct injection, non-reversible

Model: NTA855-D (M)

Rating power: 240 kW

Rating rotation speed: 1500 r/min

Starting type: compressed air/electric

Cooling type: air cooling

4.3 Auxiliary propulsion equipment

For auxiliary location abilities, there have two (2) sets rudder propeller at aft and one (1) thruster at fore.

4.3.1 Rudder propeller

Number: 2

Type: driven by frequency conversion motor, 360 degree rotation, vertical installation

Rating power: 2200kW

Rating rotation speed: about 1000 r/min

4.3.2 Bower thruster

Number: 1

Type: driven by AC frequency conversion motor, tunnel installation

Rating power: 2200kW

Rating rotation speed: about 1000 r/min

4.4 Power system

4.4.1. Fuel oil system

Main equipment and tanks

Equipment and tanks	Number set	Capacity m ³ /h	Pressure MPa	Volume m ³	Position
Fuel oil transfer pump	2	20	0.4	——	E/R
Fuel oil cargo pump	1	70	0.6	——	E/R
Fuel oil purifier	2	1.5	——	——	E/R
Main generator set fuel oil transfer pump	3	3.6	0.4	——	Engine built-in, one for each engine
Main generator set fuel oil transfer standby pump	1	3.8	0.4	——	E/R, sharing for three engines
Harbor generator set fuel oil transfer pump	2	3	0.4	——	Engine built-in, one for each

					engine
Fuel oil hand pump	1	2.88	0.2	—	E/R
No.1 fuel oil tank	1	—	—	1762	#88-#108
No.2 fuel oil tank	1	—	—	1762	#88-#108
Fuel oil dirty tank	1	—	—	115	E/R double bottom
Fuel oil overflow tank	1	—	—	29	E/R double bottom
Fuel oil drain tank	1	—	—	39	E/R double bottom
NO.1 fuel oil service tank	1	—	—	22	E/R tween.deck
NO.2 fuel oil service tank	1	—	—	33	E/R tween.deck
Fuel oil settling tank	1	—	—	38.7	E/R tween.deck
Emergency generator set fuel oil service tank	1	—	—	3	Emergency generator set room
Boiler fuel oil service tank	2	—	—	1.5	funnel

System description

Fuel oil filling system

Filling of fuel oil is to be located on bunkering station on upper deck (P&S). In the bunkering station, there has fuel oil filling joint. The bunkering station can be used for fuel oil filling, and also has the delivery function.

Fuel oil is to be filled into the fuel oil tank through bunkering station. On the filling pipes, there is to be has one pressure valve for protected over pressure for the pipes. The over pressure oil will drain to fuel oil overflow tank.

The volume of oil trunk for bunkering station is to comply with the requirement of the rules.

Fuel oil transfer system

The fuel oil transfer pump can lead oil to the fuel oil service tank and fuel oil setting tank, it can also lead oil from fuel oil setting tank to fuel oil service tank and to emergency generator set fuel oil service tank and boiler fuel oil service tank.

The overflow oil drains to fuel oil overflow tank, and then is to be pumped into fuel oil setting tank.

The fuel oil and bottom oil is to be deliver from fuel oil tank by fuel oil cargo pump, a flow meter with bypass is to be located in the delivery line.

Fuel oil service system

The diesel engines of main generator sets and harbor generator sets are to be supplied from fuel oil service tank. The return oil from the engines is to be led to the overflow tank.

The boiler and incinerator is to be supplied from Boiler fuel oil service tank. The return oil is to be led to the supply oil pipe.

The emergency generator set is to be supplied from emergency generator set fuel oil service tank.

There is to be installed diesel oil purification system consisting of a fuel oil separator. The separated sludge oil will be leading to sludge tank.

Fuel oil drain system

Dirty oil from oil trays of fuel oil pumps, fuel oil filters and fuel oil tanks drain to fuel oil drain tank.

The bottom oil of fuel oil tanks is to be pumped into the fuel oil dirty tank by fuel oil transfer pump or fuel oil hand pump.

4.4.2 Lube oil system

Main equipment and tanks

Equipment and tanks	Number set	Capacity m ³ /h	Pressure MPa	Volume m ³	Position
Lube oil transfer pump	1	5	0.3	——	E/R
Lube oil hand pump	1	3	0.4	——	E/R
Lube oil purifier	2	1.5	——	——	E/R
Main generator set lube oil drawing pump and its standby pump	4	146	0.6	——	E/R
Main generator set lube oil press-in pump	3	142	0.6	——	Engine built-in, one for each engine
Main generator set lube oil press-in standby pump	1	142	0.8	——	E/R, sharing for three engines
Harbor generator set lube oil pump	2	16.4	0.45	——	Engine built-in, one for each engine
Lube oil store tank	1	——	——	138	E/R double bottom
No.1 main generator set	1	——	——	6.39	E/R double

lube oil sump tank					bottom
No.2 main generator set lube oil sump tank	1	—	—	6.39	E/R double bottom
No.3 main generator set lube oil sump tank	1	—	—	6.39	E/R double bottom
Lube oil dirty tank	1	—	—	26	E/R double bottom
Lube oil drain tank	1	—	—	29	E/R double bottom
Lube oil purified tank	1	—	—	13.9	E/R tween.deck
Lube oil separate tank	1	—	—	9.3	E/R tween.deck

System description

Lube oil filling system

Filling of lube oil store tank is to be located on bunkering station on main deck.

Lube oil transfer system

Lube oil in store tank is to be led to lube oil purified tank by lube oil transfer pump. And lube oil can lead to the main generator set lube oil sump tanks and harbor engines' oil sumps.

Lube oil purify system

Lube oil in lube oil store tank, lube oil sump tank, lube oil dirty tank can be purified by lube oil purifiers.

The purified lube oil is to be led to lube oil separate tank and lube oil purified tank.

The separated sludge oil will be leading to sludge tank, and the working water drains to the bilge tank.

Lube oil cycle system

Lube oil cycle system of main generator engine: lube oil press-in pump built-in on engine draws oil from lube oil sump tank, press oil into engine pass through lube oil cooler, and lube oil drawing pump draws oil from the engine sump to lube oil sump tank.

Lube oil cycle system of harbor generator engine: the lube oil pump built-in on engine draws oil from the engine sump and press oil into engine pass through lube oil cooler to form a closed cycle.

Lube oil drain system

The dirty lube oil of lube oil sump tanks of main generator engines and harbor engine sump can drain to lube oil dirty tank.

All oil tray of lube oil pump, filter and tanks drain to lube oil drain tank.

4.4.3. Cooling water system

General description

Cooling water system of the vessel is to consist of five subsystems: main generator set cooling system, harbor generator set cooling system, AC/ref equipment cooling system, fore-ship equipment cooling system and aft-ship equipment.

Main equipment and tanks

Equipment and tanks	Number set	Capacity m ³ /h	Pressure MPa	Volume m ³	Position
Main generator set sea water cooling pump	3	165	0.25	—	E/R, one for each engine
Main generator set sea water cooling standby pump	1	200	0.25	—	E/R, sharing for three engines
Main generator set low temperature fresh water cooling pump	3	85	0.4	—	Engine built-in, one for each engine
Main generator set low temperature fresh water cooling standby pump	1	100	0.3	—	E/R, sharing for three engines
Main generator set low temperature fresh water cooler	3	—	—	—	E/R, one for each engine
Main generator set lube oil cooler	3	—	—	—	E/R, one for each engine
Main generator set high temperature fresh water cooling pump	3	85	0.4	—	Engine built-in, one for each engine
Main generator set high temperature fresh water cooling standby pump	1	100	0.3	—	E/R, sharing for three engines
Main generator set high temperature fresh water cooler	3	—	—	—	E/R, one for each engine
Main generator set fresh water cooling pump and its standby pump	4	30	0.3	—	E/R, one for each engine
Main generator set high temperature fresh water expansion tank	1	—	—	1.5	E/R, sharing for three engines

Main generator set low temperature fresh water expansion tank	1	—	—	1.5	E/R, sharing for three engines
Harbor generator set sea water cooling pump	2	50	0.2	—	Engine built-in, one for each engine
Harbor generator set sea water cooling standby pump	1	50	0.26	—	E/R, sharing for two engines
Harbor generator set fresh water cooling pump	2	33	0.25	—	Engine built-in, one for each engine
Harbor generator set fresh water cooling standby pump	1	30	0.28	—	E/R, sharing for two engines
Harbor generator set fresh water cooler	2	—	—	—	E/R, one for each engine
Harbor generator set lube oil cooler	2	—	—	—	E/R, one for each engine
Harbor generator set fresh water expansion tank	1	—	—	1	E/R
AC/ref. sea water cooling pump	2	240	21.5	—	E/R
AC/ref. fresh water cooling pump	2	240	46	—	E/R
AC/ref. fresh water cooler	1	—	—	—	E/R
AC/ref. fresh water expansion tank	1	—	—	1	E/R
Fore sea water cooling pump	2	200	25	—	E/R
Fore fresh water cooling pump	2	150	45	—	E/R
Fore fresh water cooler	1	—	—	—	E/R
Fore fresh water expansion tank	1	—	—	1.0	E/R
Aft sea water cooling pump	2	200	25	—	E/R
Aft fresh water cooling pump	2	150	45	—	E/R

Aft fresh water cooler	1	—	—	—	E/R
Aft fresh water expansion tank	1	—	—	1.0	E/R

System description

Main generator set cooling system

The main generator set cooling system is closed cycle of high and low cooling water.

Sea water end: The sea water pumps to take sea water from sea chests through sea main pipe and discharge overboard through low and high temperature coolers.

Low temperature fresh water end: low temperature fresh water pass through low temperature fresh water cooler, engine low temperature fresh water pump, engine air cooler low temperature fresh water end, engine lube oil cooler and then return to low temperature cooler to form a closed low temperature fresh water cycle. At the same time, low temperature fresh water pass through low temperature fresh water cooler, generator cooling pump, generator cooler and return to low temperature fresh water cooler to form parallel connection to engine low temperature fresh water cooling system. One (1) low temperature fresh water expansion tank is to be provided in E/R.

High temperature fresh water end: high temperature fresh water pass through high temperature fresh water cooler, engine high temperature fresh water pump, engine air cooler high temperature fresh water end, engine jacket water chamber and then return to high temperature cooler to form a closed high temperature fresh water cycle. One (1) high temperature fresh water expansion tank is to be provided in E/R.

Harbor generator set cooling system

Harbor generator set cooling system is to be sea and fresh water cooling system.

Sea water end: The built-in sea water pumps to take sea water from sea chests through sea main pipe and discharge overboard through engine air cooler, engine lube oil cooler, fresh water cooler.

Fresh water end: fresh water pass through fresh water cooling pump, engine turbo charger cooling chamber, engine jacket water cooling pipe, fresh water cooler and return to fresh water cooling pump to form closed fresh water cycle. One (1) fresh water expansion tank is to be provided in E/R.

AC/ref equipment cooling system

All AC/ref equipments are to be cooled by fresh water.

Sea water end: The sea water pumps to take sea water from sea chests through sea main pipe and discharge overboard through AC/ref. fresh water cooler.

Fresh water end: fresh water pass through AC/ref. fresh water cooling pump, A/C chilling unit cooler, ref. plant cooler and AC/ref. fresh water cooler to form closed fresh water cycle. Each cooler is to be parallel connection. One (1) fresh water expansion tank is to be provided in E/R.

Fore-ship equipment cooling system

All fore-ship equipments is to be cooled by fresh water.

Sea water end: The sea water pumps to take sea water from sea chests through sea main pipe and discharge overboard through fore fresh water cooler.

Fresh water end: fresh water pass through fore fresh water cooling pump, bow position winch water-cooled resistance cooler and transformer cooler, bow thruster variable-frequency motor cooler and frequency changer cooler and transformer cooler, bow position winch hydraulic brake cooler and fore fresh water cooler to form closed fresh water cycle. Each cooler is to be parallel connection. One (1) fresh water expansion tank is to be provided in E/R.

Aft-ship equipment cooling system

All aft-ship equipments is to be cooled by fresh water.

Sea water end: The sea water pumps to take sea water from sea chests through sea main pipe and discharge overboard through aft fresh water cooler.

Fresh water end: fresh water pass through aft fresh water cooling pump, stern position winch water-cooled resistance cooler and transformer cooler, stern position winch hydraulic brake cooler, hydraulic winch brake cooler, rudder propeller variable-frequency motor cooler and frequency changer cooler, stern hydraulic winch pumping station cooler and aft fresh water cooler to form closed fresh water cycle. Each cooler is to be parallel connection. One (1) fresh water expansion tank is to be provided in E/R.

4.4.4. Compressed air system

Main equipment

Equipment	Number set	Capacity m ³ /h	Pressure MPa	Volume m ³	Position
Main air compressor	2	42	3	—	E/R
Starting air reservoir	2	—	3	1.6	E/R
Emergency hand air compressor	1	10	3	—	Emergency generator set room
Emergency air reservoir	1	—	3	0.16	Emergency generator set room
Control air reservoir	2	—	1	1	E/R
Service air reservoir	1	—	1	1	E/R
Air horn air reservoir	1	—	1	0.32	E/R
Quick close valve control box	1	—	—	—	Outside E/R

System description

Starting air system

Main air compressors charge main air reservoirs directly. Each electric air compressor is to be automatic starting and stopping by pressure switch. The volume of air reservoir complies with the requirement of the rules.

The 3MPa compressed air from main air reservoirs lead to main engine and to emergency air reservoir directly, and supply 1MPa reduced air to control air reservoirs, service air reservoir and air horn air reservoir.

Control air system

The compressed air from control air reservoir is to be reduced secondly and pass through air dryer to lead to the self-priming equipment of bilge pumps and fire fighting pumps, and other various uses.

Service air system

The compressed air from control air reservoir is to be reduced secondly for the uses of sea chest blowing, pressure tanks charging, quick close valve control reservoir charging and other service.

Air horn air system

The outlet of air horn air reservoir leads to two (2) WD-2 type air horns.

Emergency air system

The starting compressed air system is to be provided for starting of the emergency generator engine. The emergency air reservoir can be charged by manual emergency air compressor and also can be charged by main air reservoir.

Pneumatic quick closing system

A quick close valve system will be mounting on the vessel for emergency shut down the fuel oil tanks' and lube oil tanks' outlet valves as required by class. The Quick close valve control box will be set outside engine room where easy to approach.

4.4.5. Boiler steam and condensate system

Main equipment

Equipment	Number set	Capacity m ³ /h	Pressure MPa	Rated evaporation kg/h	Volume m ³	Position
Fuel oil boiler	1	—	0.7	5000	—	E/R
Condenser and hot well	1	—	—	—	4	E/R
Boiler make-up water pump	2	8	1.1MPa	—	—	E/R

System description

The boiler is to be used for A/C system and warm air blowers, electric/steam hot water tank and sea chest blowing. Partial steam is to be reduced to 0.4MPa for bunker heating.

The boiler is to be fed by make-up water pump from hot well. The hot well is to be provided with condensate viewer, once there is oil in condensate, the control valve should be closed and open the drain valve at condensate pipe to drain to bilge. The float valve is to be fitted for water supplying from pressure tank.

4.5 Hull piping system

4.5.1 Bilge system

Main equipment

Equipment and tanks	Number set	Capacity m ³ /h	Pressure MPa	Volume m ³	Position
Bilge pump	3	240	0.46	——	In E/R, pump room, bow thruster room respectively
E/R bilge pump	1	45	0.28	——	E/R
Bilge tank	1	——	——	40.7	Double bottom
Dirty water tank	1	——	——	375	Double bottom
Oily water separator	1	——	——	——	E/R

System description

Bilge suction is to be mounted in void tank, aft propeller room, winch room, echo sounder tank, speed log tank and pipe tunnel and is to be connected to the engine room bilge water main pipe.

There are six (6) bilge wells in E/R (two at each side, two at midship), one (1) branch bilge suction in each bilge well, one direct bilge suction in port fore bilge well and in starboard aft bilge well. An emergency suction is to be fitted at each side.

The bilge pump in pump room and in bow thruster room can both draw the bilge of E/R.

The bilge can discharge to bilge tank, or discharge overboard or discharge on shore through an international bilge shore connection.

The bilge in chain locker is to be discharged overboard by bilge jet pump.

In general, the oily bilge is to be discharge to bilge tank, then is to be treated by oily water separator. The treated water which consistency is no more than 15 ppm can discharge overboard. The oily water separator is to be provided with sample collector to test regularly. The treated water which consistency is more than 15 ppm return to bilge, and separated oil is to be

discharge to dirty oil tank. The separator is to be washed by sea water from sea water pressure tank. All dirty oil of oil tray, sludge tank, bunker bottom is to be drained to dirty oil tank and then to discharge on shore by dirty oil pump. The separated water will discharge to the dirty water tank in some area where doesn't allow to release any oily water, and then discharge at open sea.

4.5.2. Fire fighting system

Main equipment

Equipment	Number set	Capacity m ³ /h	Pressure MPa	Volume m ³	Position
Fire fighting pump	3	200	0.86	—	In E/R, pump room, bow thruster room respectively
Fire fighting booster pump	1	2.5	1.2	—	E/R
Fire fighting hydraulic tank	1	—	—	1	E/R
Fixed CO ₂ system for E/R	1	—	—	—	Upper deck
Fixed pressure water-spraying fire fighting systems for E/R	1	—	—	—	E/R
Foam fire fighting system for helicopter deck	1	—	—	—	E/R
Fire fighting system for galley deep fryer	1	—	—	—	Galley
Fixed automatic sprinkler system for accommodation	1	—	—	—	Pump room

Water fire fighting system

The system is to be served by three (3) fire fighting pumps, all of them can supply water to fire fighting main pipe. The isolation valve will be located on the fire fighting pipes on upper deck. The hydrants in E/R is to be supplied water by the E/R fire fighting pump, can also be supplied by other fire fighting pumps through main pipe. Three (3) hydrants is to be fitted on the double bottom, on the tween deck, on the platform in E/R respectively. The fire hydrants at accommodation and on upper deck are to be arranged following the requirement of the regulation.

For keeping the pressure of the fire fighting pipe and achieving one water column

immediately, there have one (1) set fire fighting booster pump and one (1) set fire fighting hydraulic tank be connected in the fire pipe line.

Fire fighting shore connection will be located on upper deck.

Water fire fighting system can also supply anchor chain flushing.

Fixed CO₂ system

A fixed carbon dioxide gas fire extinguishing system of high-pressure type is to be applied to the engine room and painting room.

The total quantity of carbon dioxide gas installed on board is to be in accordance with the rule requirement. The diameter of pipe must ensure 85% quantity of carbon dioxide gas is to be discharged to protected places in 2 minutes. Before resealing, electric alarm system to give alarm automatically. After 20 seconds, the CO₂ release valves are to be started after ensuring that all the people escape from the E/R. All bottles can be used at one time in case of need. The bottles are to be tested regularly.

The release device is to be arranged at fire control station.

Fixed pressure water-spraying fire fighting system for E/R

Follows IMO 913, a fixed pressure water-spraying fire-extinguishing system is to be applied in E/R for protecting diesel engine, oil boiler and incinerator. The system will spray water to protected area for fire fighting with people at present, put out the fire in 5 minutes, and prepare for releasing main fire fighting system at the same time.

Foam fire fighting system for helicopter deck

A foam fire extinguishing system is to be supplied for helicopter deck.

One (1) foam mixing device (including foam tank and foam rate generator) and one foam sea water pump is to be fitted in E/R. The foam gun is to be located on fore mast where can eject directly to the helicopter deck.

Fire fighting system for galley deep fryer

The fire fighting system for deeper frying pan will be fitted on deeper frying pan bodies.

Fixed automatic sprinkler system for accommodation

A fixed automatic sprinkler system is to be applied to crew living area.

The automatic sprinkler shall be capable of immediate operation at all times and no action by the crew shall be necessary to set it in operation. The system shall be of wet pipe type. It shall be kept charged at the necessary pressure and shall have provision for a continuous supply of water as required in the regulation.

The system is consisting of pressure tank, water pump, sprinkler and etc.

4.5.3. Ballast water system

Main equipment

Equipment	Number set	Capacity m ³ /h	Pressure MPa	Volume m ³	Position
Ballast pump	4	2500	0.26	—	Pump room
Ballast pump valve remote control system	1	—	—	—	Navigation room and local
Remote surveying of liquid level system	1	—	—	—	Navigation room and local

System description

Ballast water system

There are twenty nine (29) ballast tanks on board. Four (4) larger capacity ballast pump is to be set to coordinate with lifting operation through adjusting ballast water. The system can adjust ballast water crossly and longitudinally. The four (4) ballast pumps can adjust ballast water crossly at the same time, and can adjust ballast water longitudinally regionally.

Valve remote control system

All valves of ballast system are electric control hydraulic butterfly valves. Ballast pump is to be started by remote control. The on-off of pumps and open-closed of valves is to be controlled by the remote panel in navigation room.

Remote surveying of liquid level system

The remote surveying of liquid level system is to be set to coordinate with the ballast water adjustment. Each ballast tank is to be provided with remote surveying device, the liquid level is to be indicated in navigation room.

The six- points draught indication is to be set on board.

4.5.4 Deck scuppers and sewage system

Main equipment

Equipment and tanks	Number set	Capacity p/d	Volume m ³	Position
Sewage treatment plant	2	150	—	E/R
Grey tank	2	—	62	—

System description

The discharge water will be lead from accommodation deck to main deck through scupper and pipes. The main deck discharge water will be lead to the overboard above the water line.

Grey water from bathroom, washing room, washing basin, laundry and so on tween deck, platform, main deck and upward decks is to be discharged overboard in E/R. One (1) operated storm valve is to be set at overboard place. Above grey can also drain to the grey tank.

Sewage from water closets, drain water from sickbay and drain water from galley (to pass oil skimmer) is to be collected to the sewage treatment plant. The treated water can be discharged overboard, and the remaining mud is to be pumped to the incinerator. In addition, the sewage can be discharged directly in the case emergency and outside of 12 n miles from the nearest land. If somewhere cannot allow to discharge the water even after treatment, then the water after treatment is to be discharged to the grey tank, and be discharged by the independent sewage pump to the overboard where that is allowed.

4.5.5 Air, sounding and filling system

Bunkers, lube oil tanks, ballast tanks, fresh water tanks, sea chests, etc is to be provided with air, sounding and filling devices.

Air pipes

The height of the head piece of the air pipes is to be 760mm from the deck on main deck, and 450mm on other deck above main deck. At least two (2) air pipes is to be set for the tank whose length or width is more than 7m. The area of air pipe is to be 1.25 times of the filling pipe area.

All air pipes of ballast tanks are to be led to upper deck with head pieces.

All air pipes of bunkers and lube oil tanks is to be led to upper deck with fire head pieces. The air pipe of fuel oil service tanks, fuel oil settling tank, lube oil sump tanks and engine crankcase is to be led to funnel, with protection device to prevent sea water of rain from splashing when pipes is to be destroyed.

Sounding pipes

All tanks, cofferdam, pipe tunnel is to be provided with sounding pipes.

The double bottom tanks in machine place can be terminated with short sounding pipe with sounding self-closing valves. Sounding pipes of other tanks is to be led to the place easily to approach above bulkhead deck.

Except for sounding pipes, there are remote surveying of liquid level system for ballast tanks, level gauges for bunkers, fresh water tanks, and drinking water tanks. The fuel oil service tanks and fuel oil settling tank is to be provided with the recognized flat level gauge.

Filling pipes

The filling station is to be set both sides on upper deck for bunkers and lube oil tanks.

The filling station is to be set both sides on upper deck for fresh water tanks and drinking water tanks.

4.5.6 Water service system

Main equipment

Equipment and tanks	Number set	Capacity m ³ /h	Pressure MPa	Volume m ³	Position
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Fresh water cargo pump	1	60	0.45	——	E/R
Fresh water pressure tank	2	——	0.7	1.5	E/R
Fresh water pump	3	15	0.6	——	E/R
Fresh water generator	2	50t/d			E/R
Drinking water pressure tank	1	——	0.7	1	E/R
Drinking water pump	2	10	0.6	——	E/R
Sea water pressure tank	2	——	0.7	1	E/R
Sea water pump	3	10	0.6	——	E/R
Electric/steam heating tank	2	——	0.7	1	E/R
Hot water circulating pump	3	12	0.5	——	E/R

Fresh water system

Fresh water is to be filled from the shore connection on upper deck. The fresh water cargo pump can adjust the fresh water in tanks; it also can deliver fresh water from the shore connection.

Two (2) fresh water generators are to be provided for fresh water supply.

Three (3) fresh water pumps (one for standby) draw water from fresh water tanks to fresh water pressure tank, and then deliver to galley and other washing uses, and also can deliver to main /harbor/emergency generator, expansion tanks, gravity tank of lube oil purifier, working water for lube oil purifier, hot well of boiler and water use of A/C system.

The pressure switch is to be fitted for the automatic control of fresh water pump.

Sanitary sea water system

Three (3) sea water pumps (one for standby) draw water from sea main to sea water pressure tank, and then deliver to toilets and other uses.

4.5.7 Drinking water system

Two (2) drinking water pumps (one for standby) draw water from drinking water tanks to drinking water pressure tank, and then deliver to galley and other uses.

Hot water system

Two (2) electric/steam heating tanks are to be provided for hot water supply when boiler doesn't working in summer.

The electric/steam heating tank is to be supplied by fresh water pressure tanks and depend on its pressure to supply hot water. The electric/steam heating tank is to be provided with temperature control device to keep hot water 60~70°C. There is hot water circulating pumps to circle and reheat the warm water in pipe.

4.6 Miscellaneous Equipment and Outfitting:

4.6.1 Exhaust gas system

Main equipment

Each one silencer is to be provided for main generator engines and harbor generator engines, which is 25dB spark silencer. One expansion joint is to be set at engine exhaust outlet and at suitable places. Some flexible support is to be provided.

System description

Exhaust gas of the main generator engines and harbor generator engines is to be led to atmosphere. Exhaust gas of boiler and incinerator also is to be led to atmosphere.

Exhaust gas of the emergency generator engine is to be led to atmosphere from emergency generator set room directly.

4.6.2 Ventilation system in E/R

Main Equipment

Equipment	Number Set	Capacity m ³ /h	Total pressure Pa	Volume m ³	Position
E/R supply fan	4	54000	590	—	Upper deck
E/R exhaust fan	1	84000	600	—	Upper deck
Oil purifier room exhaust fan	1	2000	540	—	Oil purifier room
Funnel supply fan	1	13000	490	—	Outside funnel

System description

There are four (4) supply fans and two (2) exhaust fans. The air in E/R can also be exhausted freely through the funnel louver. The fans are to be provided with manual control valve to close air door in case of need.

The supply air for emergency generator set room is to be supplied by E/R fan, the exhaust air is to be exhausted to upper deck through its independent fan.

Maintenance and workshop tools

- 1) Engine lathe 1 set
- 2) Vertical drill 1 set
- 3) Bench drill 1 set
- 4) Shaper 1 set
- 5) Grinder 1 set

- 6) Bench vice 1 set
- 7) Fuel injector nozzle tester 2 sets
- 8) Chain block as per E/R arrangement
- 9) Electric welder 1 set
- 10) O₂, C₂H₂ welder 1 set

Spare

The spares of all equipment are to be provided according to standard supply of the maker, and that must be complied with the requirement of the Class. The general tools are to be provided according to the requirement of the owner and general supply, see the general tools list.

4.6.3 Pipe painting

Piping and valves is to be painted after installed in E/R: one layer primer and two layers colored paint.

The piping is to be distinguished by color tape bands for the service intended, according to the international color code as follows.

Piping system	Color of paint
Fuel oil pipe	brown
Lube oil pipe	yellow
Hydraulic oil pipe	light yellow
Fresh water pipe	light grey
Sea water pipe	green
Compressed air pipe	light blue
Cooling water pipe	grey
Bilge pipe	black
Fire fighting pipe	red
Steam pipe	silver

4.7 Ventilation, air conditioning and refrigerating system on board

4.7.1 Ventilation system

General description

The area where non-conditioned is to be set mechanical or natural ventilation, the layout to comply with the requirement of air change times. The layout of ventilation in conditioned area should to keep the requirement of positive pressure.

Air change times

The air change times of main accommodation are to be as follows:

NO	Accommodation	Air supply type	Air change times (time/h)	Air exhaust type	Air change times (time/h)	Remarks
1	Sanitary unit	Air condition return	/	Mechanical	~15	
2	Toilet	Air condition return	/	Mechanical	20~25	
3	Bathroom	Air condition supply / Natural	/	Mechanical	15~20	Supplement part fresh air
4	Laundry room	Air condition supply / Natural	/	Mechanical	15~20	Partial A/C supply air
5	Ironing room	Natural	/	Mechanical	25~30	
6	Battery room	Natural	/	Mechanical	~30	dIIC-T1
7	Charge and discharge room	Natural	/	Mechanical	15~20	
8	Sickbay	Air condition supply	6~10	Mechanical		Air exhaust \geq A/C air supply
9	Medical room	Air condition supply	6~10	Mechanical	12~15	Air exhaust \geq A/C air supply
10	Changing room	Air condition supply / Natural	/	Mechanical	~8	
11	Washing room	Air condition return	/	Mechanical	~6	
12	Navigation room	Air condition supply /independent air condition	~15	Mechanical	/	Air exhaust partly as the case
13	Conference room	Air condition supply	~12	Mechanical	/	Air exhaust partly
14	Mess room	Air condition supply	~12	Mechanical	/	Air exhaust partly as the case
15	Galley	Mechanical	~35	Mechanical	~50	Partial A/C supply

NO	Accommodation	Air supply type	Air change times (time/h)	Air exhaust type	Air change times (time/h)	Remarks
				cal		air
16	Air conditioning room	Air condition return / Natural	/	Mechanical	6~12	Water cooling air conditioning unit
17	Refrigeration and air condition room	Mechanical or Natural	~30	Mechanical	~30	As the case
18	Gymnasium room	Air condition supply	8~10	Mechanical	~4	Air exhaust partly
19	Linen store	Air condition supply	~6			As balance purpose
20	Provision	Mechanical	8~12	Mechanical	~12	Frigate by air cooler
21	Winch room	Natural	/	Mechanical	6~8	Warm air blower
22	Pipe tunnel	Natural	/	Mechanical	5~8	
23	Paint store	Natural	/	Mechanical	~15	dIIB-T3
24	Lamp store	Natural	/	Mechanical	~15	dIIA-T3
25	C ₂ H ₂ room	Natural	/	Mechanical	~15	dIIC-T2
26	O ₂ room	Natural	/	Mechanical	~15	dIIC-T2
27	CO ₂ room	Natural	/	Mechanical	6~15	
28	Aft propeller room, bow thruster room	Natural	/	Mechanical	6~30	Warm air blower
29	Ballast pump room	Natural	/	Mechanical	~6	Warm air blower
30	Hydraulic pump room	Natural	/	Mechanical	10~20	Warm air blower
31	Emergency generator set	Natural / Mechanical	/6	Mechanical	~30	Warm air blower

NO	Accommodation	Air supply type	Air change times (time/h)	Air exhaust type	Air change times (time/h)	Remarks
	room					
32	Frequency changer room	Natural				Cabinet air conditioner
33	Engine workshop	Mechanical supply	~15	Natural	/	Warm air blower
34	Transformer room	Mechanical supply	15~30	Natural	/	
35	Engine room	Mechanical	/	Mechanical	/	Warm air blower
36	Oil purifier room	Mechanical	/	Mechanical	~30	
37	Engine control room	Mechanical	6~12	Natural	/	Cabinet air conditioner

The ventilation of other accommodation not mentioned refer to relevant technical requirement

4.7.2 Air condition system

Design conditions

Summer:

Outside air: dry bulb temp. 40℃, relative humidity 80%

Inside air: dry bulb temp. 27℃, relative humidity 50%, sea water temp. 32℃

Winter:

Outside air: Dry bulb temperature -20℃, relative humidity 50%,

Inside air: dry bulb temp. 20℃, relative humidity 50%, sea water temp. 0℃

Standard fresh air volume:

Living accommodation fresh air volume per person: 28.8 m³/h

Common accommodation fresh air volume per person: 18~25 m³/h

All air indirect A/C fresh air ratio: 0.40~0.50

Air conditioned area

Living accommodation:

Navigation room (complete with air cooling partial air conditioner);

Conference room;

Mess room;

Sickbay and medical room;

Gymnasium, linen store and other store;

Engine control room and frequency changer room(water cooling cabinet air conditioner);

Laundry room and bathroom(partial A/C supply air);

Galley (partial A/C supply air)

A/C type

The air conditioner in engine control room and frequency changer room is to be independent water cooling cabinet type(complete with refrigeration compressor, direct evaporator and environmental refrigerant R—404A). Other areas are to be provided by return air from single duct and constant air volume water cooling indirect evaporation type central air conditioner, that is treating the air(heat, humidity, filter, etc) in the indirect air conditioner through the duct system and then is to be led to the accommodation to keep stated temperature or humidity. The coil of indirect air conditioner is to be common type, which is the A/C chilling unit supplies chilling water in summer and supplies hot water in winter through steam- water heat exchanger. Steam is to be used for humidifying in winter.

Chill/heat source of central A/C

The chill source is to be four (4) screw chilling units, fresh water cooling.

The heat source is to be four (4) steam-water heat exchangers. The steam is to be supplied by the steam boiler (moreover to supply steam to the indirect A/C and the indirect fresh air A/C)

There are five (5) chill/heat water pumps, normally four (4) are in use and the other is in standby for the cycle of chill/heat water.

Control of A/C system

The chilling unit is to be provided with PLC all automatic running and security control, and can run automatically as per the rated output water temperature to keep the A/C end users working at rated input water temperature. The security control of chilling unit includes: air pressure protection of compressor air suction/exhaust, oil pressure protection of compressor, voltage overload protection, chilling water frost protection and chilling/cooling water interlock or water loss protection.

Steam- water heat exchanger is to be provided with steam flow regulating valve, which controls steam flow by inducing the output water temperature to control the supply hot water temperature in winter.

The end equipments of A/C system include: indirect A/C, indirect fresh air A/C. The indirect A/C induces the return air temperature through temperature controller to control the chilling water/hot water bypass flow of T-cock (that is the chilling water/hot water flow passing through the A/C coil), so as to control the refrigerating capacity and heating capacity. And it induces the return air temperature through humidity controller to control the steam flow in winter. The indirect fresh air A/C induces the supply air temperature through temperature controller to control the chilling water/hot water bypass flow of T-cock, so as to control the refrigerating capacity and heating capacity. And it induces the supply air temperature through

humidity controller to control the steam flow in winter.

The independent water cooling cabinet A/C is to be provided with chilling source and running and protection system. It only needs to connect cooling water pipes and electric source, the A/C can runs automatically at rated condition.

The air cooling independent A/C includes inside and outside machine, and it is to be provided with chilling source and running and protection system. It only needs to connect cooling water pipes and electric source, the A/C can runs automatically at rated condition. The electric heating source is to be used in winter.

4.7.3 Refrigerating provisions storage system

The vessel is to be provided chilling and freezing system. The ambient conditions are same as the A/C system.

Design parameter

Number of persons: 300

Endurance: 60 days (30 days for vegetables)

Refrigerator: fish, meat, milk, vegetable and provision.

Main parameter:

Description	Temp. (°C)	Net volume (m ³)	Capacity (t)
Meat room	-18±2	133.1	~6.210
Fish room	-18±2	68.7	~4.554
Vegetable room	4±2	165.3	~7.245
Milk room	2±2	63.0	~4.140
Provision room	17~20	162.5	~12.420
Buffer room	equilibrium temperature		

The net volume between the lower and higher refrigerator is to be allowed to adjust properly.

Refrigeration type

The means of environmental refrigerant R-404A directly evaporating and air-cooler forced cooling are is to be used. The electric heating is to be used for air-cooler defrosting.

Refrigeration equipment

Two (2) refrigeration equipments are to be used for the higher temperature refrigerator (vegetable and milk) and the lower temperature refrigerator (fish and meat). Each refrigeration equipment is to be complete with two (2) chilling compressor, one is in use and one is in

standby.

Each refrigerator is to be provided respective air-cooler, which capacity matches the capacity of relevant equipment.

Refrigerator

The combined type refrigerator is to be used. The bulkhead plate and insulation with adequate thickness is to be provided based on the calculation, and inside is to be 1.2mm polished stainless plate. The door of refrigerator should be complete with electric defrost and fire certificate corresponding to fire zoning. The floor of refrigerator is to be comply with the requirement of the owner and relevant rules.

Part V: ELECTRIC

5.1GENERAL

The design and construction of electrical equipments to be carried out according to China Classification Society (CCS) “ Rules of classification of Steel ship (2006 edition) ” and Annex IV’ The Code of Safety for Special Purpose Ships (SPS)’ of ‘Statutory Survey Regulation of Ship and Marine Facility- Technical Regulations for the Statutory Surveys of International Navigation Sea-going Ships2008’

All the electric equipments must have CCS certificates.

5.2 POWER DISTRIBUTION SYSTEM

Name	Voltage/V	Freq./Hz	Phase	Cable Core
Main Generator	AC 6600	50	3	3
Harbor Generator	AC 400	50	3	3
Thruster	AC 6600	50	3	3
Crane	AC 6600	50	3	3
Orientation Winch	AC 6600	50	3	3
Anchor Winch	AC 380	50	3	3
Ballast Pump	AC 380	50	3	3
Normal& Emergency Lighting	AC 220	50	1	2
Temp.Emergency Lighting	DC 24V			2
Galley Equipment	AC 380/220	50	3	3/2
General-Power Equip.	AC 380V	50	3	3
Communication& Navigation Equip.	AC 220V/DC24V	50/	1/	2/2

Automation System	AC220V/DC24 V	50/	1/	2/2
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5.3POWER SOURCE EQUIPMENT

5.3.1 Generator

Main generator adopt dead earthed neutral system.

Generator Technology Specification :

	Main Generator	Harbor Generator	Emergency Generator
	3 phase	3 phase	3 phase
Rating Power /kW	3380	880	200
Rating Voltage/V	6600	400	400
Rating rotate speed /r/min	750	750 或 1000	1500
Power Factor (lagging)	0.85	0.8	0.8
Working Form	S1	S1	S1
Excitation	self-excitation	self-excitation	self-excitation
Frequency /Hz	50	50	50
Insulation	F	F	F
Cooling	Air—Water	Air—Water	Air—Water
Defend Level	IP54	IP54	IP23
Start-up Mode	Automation	Automation	Automation

5.3.2 Transformer

Transformer Technology Specification:

	Main Transformer	Lighting Transformer	Emergency Lighting Transformer	Galley Transformer
Phase	3	3	3	3
Set	2	2	2	2
Rating Capability /kVA	3150	300	63	300/63
Primary Voltage /V	6600	400	400	400
Secondary Voltage /V	400	230	230	400/230
Frequency /Hz	50	50	50	50

Model	Colophony Dry	Dry	Dry	Dry
Working Form	S1	S1	S1	S1
Insulation	F	F	F	F
Connect Mode	△/Y-11	△/△	△/△	△/△
Cooling	Wind Cooling Temperature Control	Self-Cooling	Self-Cooling	Self-Cooling
Defend Level	IP22	IP22	IP22	IP22

5.3.3 Storage Battery

Capability /Ah 200

Voltage/V 24 (2×12 In series)

Type Lead-acid no maintenance

Number 12 blocks

5.3.4 Shore Power Box

Capability /kW 200

Voltage /V AC380

Frequency /Hz 50

Shore Power Cable Length /m 200

Shore Power Cable Spec 2(3X120)

5.4 POWER DISTRIBUTION EQUIPMENT

5.4.1 General

The vessel have 6.6kV medium voltage switchboard, 400V low voltage switchboard, 400V emergency switchboard.

5.4.2 6.6 kV Medium Voltage Switchboard

5.4.2.1 GENERAL

The medium voltage switchboard is an air-insulated, type-tested, metal-enclosed and metal-clad medium-voltage switchgear for indoor installation. The circuit breaker can be moved out on a modular carriage/truck. This switchgear concept meets today's owner requirements such as reliability, personal and operational safety, economy and efficiency in an optimum way.

The switchboard will be delivered in standard design with rear side covered for free-standing installation.

A set of Power Manager System is to be installed in medium voltage switchboard

No.	Name
3x	Generator panels (1250 A) with vacuum circuit-breaker and protection relay SIPROTEC 7UM62
2 x	Bus tie panel (1250 A) with vacuum circuit-breaker, including bus coupler , bus riser and protection relay SIPROTEC 7SJ6
2 x	Feeder panels (1250 A) with vacuum circuit-breaker and protection relay SIPROTEC 7SJ6 for main propulsion 2200kW
1 x	Feeder panel (1250 A) with vacuum circuit-breaker and protection relay SIPROTEC 7SJ6 for bow thruster 2000kW
2 x	Feeder panels (1250 A) with vacuum circuit-breaker and protection relay SIPROTEC 7SJ6 for 4500t crane
4 x	Feeder panel (1250 A) with vacuum circuit-breaker and protection relay SIPROTEC 7SJ6 for mooring winch 1200kVA
2 x	Feeder panel (1250 A) with vacuum circuit-breaker and protection relay SIPROTEC 7SJ6 for distribution transformer 3150kVA
2 x	Metering and busbar earthing mounted on top of the switchboard
1 set	Accessories (trolley for breakers, keys, operating handles, voltage indicating devices, etc.)

5.4.2.2 Generator Panel

Each generator panel will contain protection and monitoring of the main generators. Control- and monitoring device are located in the front of the cubicle.

The main circuit breaker will be of the vacuum, draw-out type and will be located in the middle part of the cubicle. The circuit breaker will have a motor charged spring operated closing mechanism for remote operation with emergency manual charging facility.

The cable connection compartment is placed in the lower part of the cubicle.

An earthing switch will be provided for earthing of the outgoing circuit

Current- and voltage transformers will be installed in the cable connection compartment for measuring of the operating data:

Voltage transformer for each phase

Current transformer as a 2-core-transformer for each phase (one for measuring and one for

protection)

Ring-core current transformer for selective earth fault measurement.

The protection, monitoring and control devices type SIPROTEC 7UM6231 is integrated for the low-voltage compartment of the cubicle and will provide the functions:

- Short circuit/over-current protection, $I >>$ (ANSI 50)
- Thermal overload/over-current protection, $I >$ (ANSI 51)
- Reverse power protection, $-P >$ (ANSI 32)
- Functional over power protection (32P)
- Under-/overfrequency protection (ANSI 81)
- Undervoltage protection (ANSI 27)
- Overvoltage protection (ANSI 59)
- Residual voltage protection (59N)
- Negative sequence protection (ANSI 46)
- Over-/underexcitation protection (ANSI 24/40)
- Differential protection (ANSI 87)*
- Directional earth fault protection (ANSI 67G)
- Directional over-current protection (ANSI 67)
- Non-directional over-current protection (ANSI 67)
- Earth fault over-current protection (ANSI 51G).
- Inrush current detection (ANSI 68)
- Watchdog lockout (ANSI 86)
- Thermal protection (ANSI 49G)

A control-/operator panel with soft touch keys for indication of all major status and fault conditions is part of the protection relay.

Measuring and calculation of different operation values (i.e. power factor, reactive load) and transmission via serial interface PROFIBUS DP

Separate check synchroniser for automatic synchronisation of generators to the busbar, which belongs to the Power Generation System.

The following control and monitoring devices will be provided in each of the generator panel:

The screen of the protection relay will provide on request different operation values such as

- voltage of each phase
- current of each phase

- power
- frequency
- power factor
- power consumption (kWh)
- reactive power (kVA, kVAR)

Alarm indications will be provided such as:

- earth fault
- differential protection
- short circuit

Control push buttons will be provided such as:

- manual-automatic-switch.
- ON/Off push button.
- up-and-down-switch for manual governor speed adjustment.
- ON/Off push button for anti-condensation heater of generators, if applicable
- Analogue ammeter (96 x 96 mm) with selector switch 0-L1-L2-L3. (Class 1.5)
- Analogue double voltmeter (96 x 96 mm) with selector switch 0-L1-L2-L3. (Class 1.5)
- Active power meter (96 x 96 mm) (Class 1.5)
- Reactive power meter (96 x 96 mm) (Class 1.5)
- Double frequency meter (96 x 96 mm). (Class 1.5)
- Auto Synchroscope
- Manual Synchroscope
- Operating cycle counter. (inside vacuum circuit breaker)

Position indicator for following functions

- circuit breaker ON / OFF
- draw-out unit in operation position
- earthing switch ON/OFF

5.4.2.3 Bus-tie Panel

Current transformers will be installed in the cable connection compartment for measuring of the operating data:

The main circuit breaker will be of the vacuum, draw-out type and will be located in the

switchgear compartment which is in the middle part of the cubicle. The circuit breaker will have a motor charged spring operated closing mechanism for remote operation with emergency manual charging facility.

The bus-tie panel will contain protection and monitoring unit, which is located in the front of the cubicle.

- Current transformer as a 2-core-transformer for each phase (one for measuring and one for protection)
- Ring-core current transformer for selective earth fault registration

Protection, monitoring and control device, type SIPROTEC 7SJ6412 is integrated in the low-voltage compartment of the cubicle and will provide the functions:

Protection, monitoring and control device, type SIPROTEC 7SJ6412 is integrated in the low-voltage compartment of the cubicle and will provide the functions:

- Short circuit/over-current protection, $I >>$ (ANSI 50)
- Over-current protection, $I >$ (ANSI 51)
- Under voltage protection (ANSI 27)
- Over voltage protection (ANSI 59)
- Earth fault protection (ANSI 59N)
- Watchdog lockout (ANSI 86)
- Measuring and calculation of different operation values (i.e. power factor, reactive load) and transmission via serial interface PROFIBUS DP
- Separate check synchronizer* for automatic synchronisation of busbar to the busbar, which belongs to the Power Generation System.

A control-/operator panel with soft touch keys for indication of all major status and fault conditions is part of the protection relay.

The following control and monitoring devices will be provided for the bus tie panel:

The screen of the protection relay will provide on request different operation values such as

- Voltage of each phase
- Current of each phase
- Frequency

Alarm indications will be provided such as:

- Earth fault
- Short circuit

Control push buttons will be provided such as:

- Manual-automatic-switch.
- ON/Off push button.
- Analogue ammeter (96 x 96 mm) with selector switch 0-L1-L2-L3 (Class 1.5).
- Analogue double voltmeter (96 x 96 mm) with selector switch 0-L1-L2-L3 (Class 1.5).
- double frequency meter (96 x 96 mm). (Class 1.5)
- Auto Synchroscope
- Manual Synchroscope
- Mechanical operating cycle counter (inside vacuum circuit breaker) operating cycle counter.

Position indicator for following functions:

- circuit breaker ON / OFF
- draw-out unit in operation position
- earthing switch ON/OFF

5.4.2.4 Busbar Metering and Earthing

Each busbar section / each switchboard will be equipped with a voltage transformer and a busbar earthing switch. The busbar voltage signals will be transferred to the other panels (i.e. bus coupler and generator panels) for protection, synchronization and monitoring. The earthing switch is used for busbar earthing

The voltage transformer and earthing switch will be installed within additional compartments on top of the switchboard.

5.4.2.5 Outgoing Feeder

Each outgoing feeder panel will contain one protection unit for protection and monitoring of the related consumer. The protection unit is located in low voltage compartment of the feeder panel.

The main switching device will be a circuit breaker of the vacuum, draw-out type and will be located in the switchgear compartment which is in the middle part of each outgoing feeder panel. The circuit breaker will have a motor charged spring operated closing mechanism for remote operation with emergency manual charging facility.

The cable connection compartment is placed in the lower part of the panel.

An earthing switch will be provided for earthing of the outgoing circuit

Current transformers will be installed in the cable connection compartment for registration of the operating data:

- Current transformer as a 2-core-transformer for each phase (one for measuring and one for protection)
- Ring-core current transformer for selective earth fault registration

Protection, monitoring and control devices are integrated in the low-voltage compartment of the cubicle and will provide the functions:

- Short circuit/over-current protection
- Over-current protection
- Negative sequence protection
- Thermal overload protection
- Inrush current detector
- Non-directional earth-fault protection
- Under voltage protection
- Earth fault over-current protection
- Auxiliary trip

A control-/operator panel with soft touch keys for indication of all major status and fault conditions is part of the protection relay.

The following control and monitoring devices will be provided for the outgoing feeder panel:

The screen of the protection relay will provide on request different operation values such as

- Current of each phase

Alarm indications will be provided such as:

- Short circuit

Control push buttons will be provided such as:

- manual-automatic-switch.
- ON/Off push button.
- ON/Off push button for anti-condensation heater of switchboard compartment, if applicable

Analogue ammeter (96 x 96 mm) with selector switch 0-L1-L2-L3 (class 1.5)

Operating cycle counter.

Position indicator for following functions

- Circuit breaker ON / OFF
- Draw-out unit in operation position
- Earthing switch ON/OFF

5.4.3 400V Low Voltage Switchboard

400V Low Voltage Switchboard is self-supporting steel frame structure, the door-type structure behind the switchboard, cable connect from back of switchboard. Its dimension is:

About 11,000 (L) × 1000 (deep) × 2212 (H)

The low voltage switchboard is equipped with required voltage meter, ammeter, power meter, power factor meter, frequency meter, the synchronization meter, megger and other measuring instruments and switches, buttons and lights.

Low voltage switchboard measuring instruments used in wide angle marine meter.

The main switch of generators have function as follows: overload long time delay tripping, overload short delay trip, short circuit protection and instantaneous tripping protection loss voltage release. The closing types adopt electric and manual closing of two electric ways.

Low voltage switchboard bus bar is divided into two independent segments, segment located between the contact switch. These two separate segments supply power to electricity load, respectively.

Dual sets of power equipments connected on two independent segments respectively as far as possible. Two air compressors, power sources from low voltage switchboard and emergency switchboard.

Low voltage switchboard set the reverse power relay and the power insulation monitoring device.

Low voltage switchboard set the pre-alarm protection of generators. When the generator load reach to 100% of its rated power, the alarm part send the audible and visual alarms signal, if the rate of generator load sustained at this level up to 10 min, low voltage switchboard will be automatically dropped parts of the secondary loads .

Low voltage switchboard also set the following protections. When the two generators running in parallel, a running generator out of operation for some reasons, automatic unloading equipments can be released immediately withdraw from the electric grid, ensuring another generator can supply electric power to equipment and systems of the safe operation of the ship, and sending audible and visual alarm signal, indicating that the failure of two generators operating in parallel, reminding the duty people to pay attention.

Synchronization Operation between each generator adopts quasi-synchronization in manual and automatic synchronization pulse way.

Low voltage switchboard set the automatic frequency modulation & load modulation device of generator, to ensure that the uniform of load distribution and stability of the three generators in parallel operation.

Rating voltage /V	3 Phase 400
Rating current /A	5000
Rating breaking capacity /kA	65 (By the short circuit current calculation of the board manufacturer)
Number/panel	15
Harbor generator panel	2
Main transformer panel	2
Bus bar panel	1
Load panel	6
Group starter panel	4
Breaker	Schneider MT or NSX type ABB E or T series

5.4.4 Emergency Switchboard

Emergency generator has automatic starting device, providing the emergency power supply to emergency loads through the emergency switchboard. When the low voltage switchboard after power failure, emergency generators start automatically within 45 seconds, after the automatic closing device test voltage and frequency, automatic closing device send a closing signal. Switch of the emergency switchboard close automatically and supply power source. Under normal condition, low-voltage switchboard provide power supply to emergency switchboard by the contact switch, setting the appropriate interlock to prevent the emergency board provide power supply to low voltage switchboard.

Rating voltage /V	3 Phase 400
Rating current /A	361
Rating breaking capacity /kA	42 (By the short circuit current calculation of the board manufacturer)
Number/panel	3
Emergency generator panel	1
Load panel	2
Breaker	Schneider NSX type or ABB T series

5.5 WORKING CONDITION & ELECTRIC POWER LOAD

The working generators in different conditions of the vessel and electric power load see "electric power load estimating"

5.6 .GENERATOR RUNNING MODE

5.6.1 Generator running mode spec

Any two of main generators can be long-term parallel running, three main generators also can be long-term parallel running. Two harbor generators can be long-term parallel running, and parallel running with the main transformer in short time, transfer load.

5.7 .CONTROL EQUIPMENT

5.7.1 All-direction propeller and bow thruster

2 sets of all-direction propeller and 1 set of bow thruster adopt frequency control, the motor as the prime mover supply the power.

These 3 sets of motors adopt medium-voltage 6.6kV variable frequency control, 3 sets of motors can be controlled by wheelhouse console or local control box, and can be interchangeable. Before motors startup, motors send start request signal to the main switchboard. The main switchboard sends allow- startup signal to motors after the generators of satisfy load requirements running in parallel. At the same time, propulsion tank fans and zero pitch position are interlock control.

5.7.2 Positioning winch control equipment

Positioning winches adopt frequency control.

Frequency control system technical specification of positioning winches is as follow:

(1) Transformer

Type	Cast Resin Dry-type (three-winding)
Number	2
Phase	3
Rated capacity /kVA	2000
Primary voltage /V	6600
Secondary voltage /V	
Frequency /Hz	50
Working form	S1
Insulation	F
Connect mode	$\Delta/Y+\Delta$
Cooling	wind cooling temperature-controlled
Protection type	IP22

(2) Frequency Counter

Frequency Converter Type	AC—DC—AC Voltage-type PWM control
Number	12
Frequency Converter Power /kW	400
Pulse Count	12
Input voltage /V	
Input frequency /Hz	50
Output voltage /V	
Output frequency /Hz	0~50 Constant torque 50~150 Constant Power
Mode of braking	Energy Resistance
Cooling type	Wind cooling
Control conversion	Wheelhouse console—Location control
Speed measure feedback	No

5.7.3 Motor Starting Control

The electric source of ballast pump is from low voltage switchboard breaker, starter adopts star / angle starting methods. Start/stop buttons and contactor coil form start and stop circuit. Ballast pump can be controlled by the wheelhouse ballast console or local starter near the ballast pump.

Other motors adopt direct starting method. If starter is not in the vicinity of the motor, start and stop button should be installed near the motor.

Fans, pumps, oil separator, air conditions, emergency shut off button should be set.

The starter of automatic control equipment shall be equipped with the automatic - manual switch.

5.7.4 Engine control room console

Engine control room console, as engine mechanical and electrical equipment monitoring and control equipment, is provided in engine control room. Engine control room console include equipments as follow:

(1) Monitoring and alarm device of three main generators, two harbor generators, electric propulsion devices and critical auxiliary system, the device has extended alarm.

(2) Pump running indication

(3) Automatic telephone、sounder telephone

(4) Engineer calling equipment

(5) Main generators fault reset

5.7.5 Wheelhouse Console

Wheelhouse console, as all vessel navigation and working (except crane) monitoring and control equipment, is installed in wheelhouse. Wheelhouse console include equipments as follow:

- (1) Remote control and display unit of rudder propeller
- (2) Bow Thruster remote control and display unit
- (3) Radar
- (4) VHF
- (5) GPS
- (6) Controller of foghorn
- (7) General alarm panel
- (8) Fire alarm control panel
- (9) Emergency shutdown button
- (10) Navigation lights control unit
- (11) Signal lights control unit
- (12) Public address remote control unit
- (13) Automatic telephone
- (14) Command sounder telephone
- (15) Lighting distribution box
- (16) Work light distribution box
- (17) Navigation device distribution box
- (18) DC24V distribution box

5.7.6 Ballast Console

- (1) Control of the vessel ballast
- (2) The vessel ballast tanks level and ship draft monitoring device

5.7.7 Winch Console

- (1) Positioning winch control
- (2) Winch TV monitoring system

5.7.8 Main Transformer Pre-magnetizing Device

Main transformer pre-magnetizing device should be set to reduce the impact of the current starting.

5.8 .LIGHTING EQUIPMENT

5.8.1 Normal Lighting

In general, Fluorescent pendant light (IP56) is to be fitted in machinery spaces、washing room、deck cabin、store、weather deck. Fluorescent ceiling light is to be fitted in accommodation, fluorescent ceiling light (IP44) is to be fitted in galley、bath room.

(1) Machinery spaces

2x40W Fluorescent pendant light (IP56) is to be fitted in engine room、winch tank、propeller tank、ballast pump room. 2x20W Fluorescent pendant light (IP56) is to be fitted in other spaces.

Lights must be fitted in two-way crossover layout in engine room.

(2) Accommodation

a) Fluorescent ceiling

2x20W Fluorescent ceiling light is to be fitted in wheelhouse、captain room、chief engineer room mess room and sailor rooms etc.

b) Reading lamp

Reading lamp socket is installed on each desk in cabin.

c) Bedside lamp

8W fluorescent bedside light is installed on side of each bed.

d) Mirror box light

8W fluorescent type mirror light over the mirror of each wash basin.

e) Walkway lights

1X20W fluorescent Angle Light is installed on each desk in inner passage.

(3) Explosion-proof light

60w explosion-proof light must be installed in battery room、paint store、O2 room and C2H2 room. The switches are installed on safe area.

(4) Exterior lighting

Exterior lighting adopt 2X20W fluorescent pendant light.

5.8.2 Emergency lighting

Emergency lights are installed in the following room and spaces:

Engine room、working room、life boat area、passage、stairs and entrance

In the crew rooms, the bedside lamp ,as emergency lighting power, is to be fitted beside each bed, no temporary emergency.

5.8.3 Temporary emergency lighting

Temporary emergency lights are fitted in wheelhouse、inner passage、stairs、engine room、emergency generator room、rudder Propeller tank、galley、engine control room、outer passage. After the emergency power supply lose power, DC24V temporary emergency power put into automatic by the charging and discharging board. Temporary emergency lighting are equipped with 5W fluorescent bulb used as the light source.

5.8.4 Searchlight and floodlights

Two 1000w searching lights are to be fitted on compass deck.

Two 800w floodlights are to be fitted on bow of the vessel.

About fifteen 400W floodlights are to be fitted on main crane area and crane area, as deck working lighting.

Four 400w floodlights are to be fitted on bow of deck B, as bow lighting.

400W floodlight is to be fitted on each side of deck B, as life boat area lighting

Four 400w floodlights are to be fitted on each winch tank, as winch tank complementarity lighting.

5.8.5 Navigation Lights and Signal Lights

1 set of navigation lights and signal lights panel is installed in the wheelhouse console. Dual AC220V power supplies are from low voltage switchboard and emergency switchboard, automatic conversion, with VDR interface.

The vessel set navigation lights(double ply) as follow: forward mast light 、stern mast light 、mast light、 port light and starboard light.

The vessel set signal lights as follow: 1 bow anchor light,1 stern anchor light, 8 Red round lights, 4 Green round lights, 2 White round lights, One (1) Morse light on radar mast, this light to be commonly used as air horn signal light

One (1) portable daylight signal light (ALDIS type) with two (2) receptacles (DC 24V) fed from battery with charger.

5.8.6 Helicopter Deck Perimeter Lamp System

Perimeter lamps and flood lights are to be fitted around the helicopter deck.

5.9 COMMUNICATION EQUIPMENT

5.9.1 Sound Power Telephone

A set of command type sound power telephone system is to be provided in the vessel. The system has busy force calling function.

Command sound power telephone is installed in wheelhouse console. Sound power telephones are installed in engine room、engine control room、winch tanks、rudder tank、emergency generator room、bow thruster tank. Headset sounder power telephone is to be

installed in noise area.

Power supply is DC 24V.

5.9.2 Automatic Telephone System

One (1) set of about 180 circuits automatic telephone system to be located in the vessel.

To be fed from 220 volts A.C. and 24 volts battery.

Automatic telephone is installed on wheelhouse、engineer control room、mess room、conference room、captain room、chief engineer room、hydraulic pressure pump room、air condition room and other cabins .Headset automatic telephone is to be installed in noise area

First preference is wheelhouse and captain room.

Second preference is engine control room、chief engineer room、electric engineer room、mess room etc.

Shore interface is fitted on the vessel.

Automatic telephone connect with public address, for finding people through public address remote

Automatic telephone connect with INM.F, for dialing marine satellite telephone.

5.9.3 Public Address

One (1) set of public address with 2x250 Watts amplifier are to be provided in the vessel. Main unit is fitted on wheelhouse.

Power supply is to be fed from 220 volts A.C. and D.C. 24V.

Low and high sound loudspeakers are fitted on each sailor cabin、mess room、conference room、working tank and so on. Proof-water loudspeakers are to be fitted on wet areas.

Two 50W loudspeakers are installed on compass deck. For shouting to external.

Public address remote control stations are to be installed on wheelhouse、crane area and life boat 在 area.

5.9.4 Broadcast & TV Antenna System and Satellite Television System

5.9.4.1 Broadcast & TV Antenna System

Broadcast & TV Antenna System is to be provided in the vessel, for receiving broadcast & TV signal, playing DVD.

Branch divider and terminal box are fitted on habitation cabins、mess room、conference room etc. Broadcast & TV Antenna is installed on compass deck, power supply is AC 220V.

5.9.4.2 Satellite Television System

A set of Satellite Television System is to be provided on the vessel.

Antenna is installed on suitability place.

5.9.5 Engineer Calling System

The vessel has a set of engineer calling system.

The host in the engine control room, fixed responder in the chief engineer's room, first engineer room, second engineer room, electrical engineer room, mess room.

The power supply is D.C. 24V.

5.9.6 Ref. Chamber Alarm System & Infirmary Calling Alarm System

The ref. chamber alarm system is fitted on the vessel.

The alarm switches are fitted in the refrigerators. The alarm signal devices are fitted in the galley, mess room and wheelhouse console.

The vessel set an infirmary calling system.

Call switch in the sickbay, hospital call main unit in the medic. room. Call responder is fit on the wheelhouse console.

5.9.7 Wired Television Monitoring System

Television Monitor is installed in wheelhouse. Working power source is AC220V

Video cameras are to be fitted on winch tank.

5.9.8 Local area network system

The ship has a local area network system, including the following equipment:

- 1) Server
- 2) ups
- 3) exchanger
- 4) router

5.10. ALARM SYSTEM

5.10.1 Group Alarm System

Combined group alarm panel to be installed in engine room for audible and visible alarm of general alarm, fire alarm, CO2 releasing alarm, telephone calling, telegraph and engine trouble alarm.

To be fed from A.C. 220V and D.C. 24V.

Repeater is installed in the engine control room console.

2 Combined group alarm panels are to be installed in engine room of bottom top.

4 Combined group alarm panels are to be installed in engine room of tween. deck.

4 Combined group alarm panels are to be installed in engine room of flatform.

1 Combined group alarm panel is to be installed in ballast pump room.

5.10.2 Fire Alarm System

Fire alarm control panel is installed in wheelhouse console, power source are AC220V&DC24V.

Heat detector of explosion-proof, heat detector, smoke detector are to be fitted on each sailor cabin, mess room, conference room and important working tanks. Alarm push buttons are to be fitted on the entrance of engine room and stairs.

When anyone of detectors and push buttons acting, fire alarm control panel send lighting & sound alarm signal. If don't arose notice in 2 minutes, general alarm send lighting & sound alarm signal to passages, engine room, crane area automatic.

Fire alarm repeaters are to be installed in CO2 room and engine control room.

5.10.3 General Alarm System

General alarm panel is to be provided on wheelhouse console.

General alarm system include alarm unit, alarm button and annunciator.

General alarm system send general alarm signal to all vessel. Sound & Lighting annunciators should be installed on all cabins toilet unit and working room, inner passages.

General alarm system of alarm signals to be linked with public alarm to be located.

Three-way power supply are fed with main switchboard, emergency switchboard and charge & discharge board.

5.10.4 W.T. Door Alarm System

A set of W.T. Door Alarm System is installed in the vessel, when the watertight doors closed, the door and the wheelhouse should be sent out alarm signal. Alarm remote control panel shall be installed on the wheelhouse console.

5.10.5 CO2 Releasing Pre-Alarm System

One (1) set of CO2 releasing pre-alarm system to be installed in the vessel.

The system send signal to combined group alarm panel and emergency shutdown system.

The system send leak and failure signal to engine monitor alarm system.

2 light & Buzzer alarm siren is installed in engine room.

1 light & Buzzer alarm siren is installed in funnel boiler area.

1 light & Buzzer alarm siren is installed in funnel incinerator area.

1 light & Buzzer alarm siren is installed in oil separator room.

5.10.6 Monitor Alarm System

A set of monitor alarm system is to be provided on engine control room. Monitor alarm system collection all vessel important equipments monitor alarm signals, and extended to wheelhouse、chief engineer room、second engineer room 、third engineer room、and electric engineer room.

Monitor and alarm system include: Data collection unit、Monitor and alarm center unit、Display、Control keyboard、Failure printer.

Engine monitor and alarm system has register function. For safe &credibility of the system, double P.C. system is installed in engine control room, Alarm PC should be fitted on wheelhouse、chief engineer room、second engineer room 、third engineer room、and electric engineer room.

5.10.7 Fireproofing Door Indication System

A set of fireproofing door indication system is installed on the vessel. Display device is installed on the wheelhouse console. Power supply is A.C.220V and D.C.24V.

5.11 .NAVIGATION EQUIPMENT

5.11.1 Echo Sounder

One (1) set of echo sounder is to be installed in the vessel. Two transducers are to be provided , transition switch is installed in wheelhouse, for observing water depth of bow and stern.

Sounding range is 0.5 - 500 m.

Echo sounder system include:

- 1 –Main display unit
- 2 – Transducer junctions
- 2 - Transducer

Main LCD display unit with Chinese is fitted on wheelhouse, transducer are installed on bow& stern echo sounder tank.

Power sources are AC220V & DC 24V.

5.11.2 Radar

Two (2) complete sets of radar shall be provided as follows:

23” Display are installed on wheelhouse console

Measure range: 0.125~96n m

Antennas are installed on mast

Radar has interface with DGPS.

Power source is AC 220V.

5.11.3 DGPS

Two (2) DGPS navigator shall be provided in wheelhouse, including:

2–DGPS antenna

2 –DGPS Display Unit

2 –Distribution Unit

Power supply is to be fed from 220 volts A.C. and 24V D.C.

DGPS signal shall be connected to GMDSS、Radars、 AIS.

5.11.4 GPS

One (1) GPS navigator shall be provided in the vessel, sending navigation signal to AIS.

5.11.5 Weather Instrument

One (1) set of weather instrument shall be provided.

1– Transmitter of anemometer on the radar mast

1– Humidity sensor on the radar mast

1 – Display unit in the wheelhouse.

To be fed from 220 volts A.C. & D.C. 24 volts

5.11.6 Weather Facsimile

One (1) set of weather facsimile with paper shall be provided in chart space, for receiving and printing radio weather facsimile. The system include receiver、 printer unit、 antenna.

To be fed from 220 volts A.C.

5.11.7 AIS system

One (1) set of AIS equipment is to be installed in vessel, for sending and receiving navigation information. The system includes: AIS main unit、 LCD display with keyboard、 antenna、 power supply equipment.

Power sources are AC 220V DC 24V.

5.11.8 Window Wiper & Clear View Screen

A certain number of wipers and C.V.S. are fitted on the windows of wheelhouse, the controller is installed in the wheelhouse control console.

Power supply is AC 220V.

5.11.9 Fog whistle

The whistle system shall be provided as follows:

1 -Air horn with a heater on the radar mast

1 - Signal control panel with time controller, sound selector switch and push button in wheel house console

2 -Each one (1) push button at bridge wing

The manoeuvring light and whistle shall be able to be controlled synchronously by the signal controller.

5.12. RADIO COMMUNICATION SYSTEM

5.12.1General

The vessel radio communication equipment include:

GMDSS、INM.F、VHF—AM and NDB

GMDSS radio equipment include:

GMDSS、VHF、NAVTEX、two-way VHF radio telephone、EPIRB、radar transponder

Radio communication equipments are to be in compliance with requirements of GMDSS sea A1, A2, A3.

Equipments must have CCS certificates.

Radio equipment distribution box is to be installed in the wheelhouse. Power source are to be fed from AC400V switchboard & emergency switchboard, automatic conversion. When Radio equipment distribution box failure, sending sound & lighting signal.

5.12.2Radio equipment

1. GMDSS include:

A)MF/HF (2 extend alarm buttons) 1 set

B) INM.C system 1 set

C) DC24V emergency light

D) GMDSS console

2. VHF 2 sets

5.12.3 NAVTEX

One set of navigating alarm receiver to be fitted on the vessel.

5.12.4 INM.F

A set of INMARSAT-F station is installed in the wheelhouse, for talking、fax、video conference、internet and high speed data transmit.

5.12.5 VHF-AM

VHF-AM, for communicate with the helicopter, is arranged in the wheelhouse.

5.12.6 NDB

One set of Radiophare (NDB) is arranged in the wheelhouse, using for sent the navigation signals to the helicopter.

5.12.7 Other radio equipments

- Three (3) sets of two-way VHF radio telephone and (3) sets battery charger to be provided.
- One (1) set of 406MHZ Emergency Position Indicating Radio Beacon (EPIRB) to be provided on compass deck.
- Two (2) sets of radar transponder (9 GHZ) are to be provided.
- Six (6) sets of handset radio interphones and (6) sets battery charger to be provided.

5.13 .Other**5.13.1 Level Remote Measure & Sea gauge Electrical System**

Level Remote measure & sea gauge electrical system is to be provided in the vessel. The system monitor ballast tank level and sea gauge. The liquid level sensor send signal to the system. Liquid level & sea gauge can be showed in wheelhouse and engine control room.

The liquid level froth-type sensors are fitted on ballast tanks, instruments are to be installed on ballast control console, 1 working control machine is to be provided, for display and deposited data.

5.13.2 SSAS

One (1) set of Ship Security Alert System (SSAS) in compliance with the requirement of SOLAS XI-2 to be installed. Integrating with INM.C. When come up against pirate, it can send weft, push button is fitted on shelter.

5.14. EARTHING**5.14.1 Earthing**

All electric equipments and cables must be connected with earth according to some standard rules

5.15. CABLE

In general, CJPJ85/SC type cables are to be provided in cabins. CHJPJ85/SC type cables are to be provided in navigation and communication systems. CJPJ85/CHJPJ85/NC type cables are to be provided in emergency systems.

Cable conductor section according to the highest working temperature of the core allows for 85 °C, rating current the ambient temperature 45 °C to choose. For bundles or environmental

temperature more than 45 °C, the cables need according to the correction coefficient to make, correcting the core temperature remained at work scope.

Cable laying and installation must be according to built by ships specification requirements.