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				 天津滨海博泰海事工程技术有限公司 Tianjin BesTech Marine Engineering Consultant.Co. Ltd					

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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 electric installation of the 900t lifting capacity crane barge.

The following plans are to be associated with and to form an integral part of the Specifications.

Drawing No. : BT922-100-04 General Arrangement

Drawing No. : BT922-400-01 Machinery Arrangement in Engine Room

Drawing No. : BT922-110-11 Midship Section

It is to be understood that the descriptions in the General Part are to be applied to the whole of the subsequent parts viz. Hull, Outfitting, Machinery and Electrical parts, whereas those in the subsequent parts are to be primarily applied only to the relevant part in which they appear and to have no effect elsewhere.

Anything twice or more mentioned in the Specifications is to be only once supplied or executed.

If there should be any inconsistencies or contradictions between the Specifications and plans, the former is to be given priority.

Details of the design and construction not covered by the specification are to be carried out according to international shipbuilding practice/ standard.

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

RINA: Italian Classification Society

CCS: China Classification Society

IMO: International Maritime Organization

1.2、 General Descriptions

The vessel is to be designed and built as a non-propulsion 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 900t 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 are 900t during boom fixed at aft and 400t during boom at full revolving, the span of lifted cargoes to revolving center are 24m and 30m at above two conditions.

The vessel shall be mainly used to lifting and installation of offshore facilities, bridge modules and assist port and man-made inland building.

The vessel can transit for unrestricted worldwide service and can operate at permitted conditions within 200 miles from Shore, which are described as below:

Water Depth:	8~100m
Height of Wave	abt. 2.0m
Wind Velocity	10.7m/s (Beaufort Class 5)
Current velocity	3.0kn
Ambient temperature	-15℃~45℃
Aft lifting 900t	Trim angle 3°, Heel angle 5°
Full Revolving 400t	Trim angle 3°, Heel angle 5°
Transit	Pitching 10°, Rolling 20°

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

Ambient temperature	-15℃~45℃
Sea Water temperature	-15℃~45℃

1.3、 Main Particulars

Length Overall L_{OA}	134.80m
Length Between Waterline L_{WL}	132.0m
Breadth Moulded B	32.26m
Depth Moulded D	10.30m
Maximum Working Draught	6.10m
Maximum Transit Draught	5.50m
Number of Crews	68
Number of Special Personnel	130
Displacement during lifting Δ	25103.00t
Displacement during transit Δ	22448.00t
Coefficient C_B (without appendage)	0.912
Endurance	60 days

Performance of Lifting crane:

The lifting crane can be operated in the manner of slewing, hoisting and revolving, the lifting capacity of each hook to be as below:

Main Hook fixed at aft 900t×30m

Main Hook revolving400t×30m

Auxiliary Hook.....300t

Small Hook.....50t

Height Between Decks:(at centerline)

Main deck-----Forecastle deck4.00m

Forecastle deck-----A Deck3.40m

A Deck-----B Deck3.20m

B Deck-----C Deck3.00m

C Deck-----Navigation Deck2.80m

Navigation deck-----Compass Deck3.10m

Sheer0mm

Camber0mm

Frame spacing850mm

1.4、 Class, Rules, Regulations and Certificates

The vessel is to be registered in Liberia/Bahamas/Panama 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.A266(84) (2008 SPS Code)
2. RINA 《Rules for Classification of Ships》 2010
3. CCS 《Steel Vessel Rules》 2009
4. CCS 《Rules for Lifting Appliances of Ships and Offshore Installations》
5. Marine Laws and Regulations of government of the ship's Flag
6. International Load Line convention (ILLC), 1966 and amendment.
7. International Regulation for Prevention of Collision at Sea, 1972 and amendments.
8. International convention for prevention of Pollution from ships, 1973 and protocol of 1978 with latest amendments.
9. Protocol for Marpol 73/78 annex VI; regulation for prevention of Air pollution from ships – Nox emission control.
10. Compliance with Marpol for Air Pollution Prevention

11. International Regulations for Tonnage Measurement of Ship, 1969
12. ISO 6954-1984 (E), Guidelines for Overall Evaluation of Vibration in Merchant ship
13. IMO Resolution A468 (XII), Code on Noise Levels on Board Ships
14. IMO Resolution MSC.267 (85) – Adoption of The International Code on Intact Stability, 2008
15. CAP437 for Helicopter Facilities

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

RINA ★HULL Barge Crane, Assisted Propulsion, Helicopter Facilities, Operation Service within 200 miles from Shore, Unrestricted Navigation
★MACH

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 double skin (except fore peak tank) and one complete continuous freeboard deck with forecastle deck. The six(6) watertight compartments

to be divided by vertical corrugated and planed transverse watertight bulkheads.

200 persons Accommodation with navigation and control house be located fore part, Engine room to be located middle of vessel. Double bottom to be arranged in engine room and other area except fore and aft peak tanks.

Two winch rooms to be located fore and aft part of vessel, 4×75t winches used to positioning the vessel during lifting operation to be accommodated in each of winch rooms.

The two rudder propellers and it's drive engine 746kW each to be accommodated in aft peak tank, the rudder propeller shall use to assist during transit of vessel or low speed and short distance movement during lifting operations.

The 900t lifting capacity revolving crane to be located aft, the diameter of crane pedestal is 17m, the total boom length is 67m, the boom rest and hook accommodated boxes to be located at starboard aft end of forecastle deck.

Helicopter deck and facilities to be fitted at fore part of vessel and above to accommodation.

The layout of vessel shall be as below:

A、 Double bottom

Double bottom to be arranged 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, Cooling water tanks, Fuel oil Overflow tank, Lubrication oil tank, Bilge tank, Sewage tank, Dirty water tank, Dirty oil tank, sludge tank, etc.

B、 Tank top to Main deck

The following tank or room to be arranged between tank top to main deck: Aft propeller tanks, Crane foundation, Aft winch room, Drinkable water tank, Fuel oil tanks, Engine room, Fore winch room, Void tanks, Etc.

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

The fore peak tank is used to water ballast and is divided into port, starboard tank and central tank.

C、 Main deck

The main deck is complete continuous freeboard deck, 900t lifting capacity revolving crane to be located aft main deck, Three store rooms and One hydraulic control room to be arranged in the column crane pedestal.

The four group aft mooring fairlead, roller etc are arranged aft main deck starboard and port side. Such mooring system shall be used position the vessel before lifting operation.

The middle main deck is arranged as load deck cargoes and storage anchors, the uniform deck load is 7.5t/m^2 , The wooden sheathing shall be provided above main deck of carrying deck cargoes.

One portable crane of capacity of 15t×25m to be arranged port side of middle main deck in order to transport deck cargoes, foods and spare parts on board.

The fore part main deck to be sheltered by forecastle deck, the following service spaces to be arranged: Oxygen room, Acetylene room, Painting Room, Emergency generator room, CO₂ room, Refrigerating and Air Conditioning room, Galley, Mess room, Provision room, Fish/Meat/Vegetable Room, Laundry, Changing room, Hospital, etc.

Two(2) Four-person living room and doctor room are also arranged on the fore part main deck.

D、Forecastle Deck

Eighteen(18) Four-person living rooms, Meeting room, Laundry, Bath room, WC, Linen and air conditioning room etc. to be arranged in accommodation on forecastle deck.

75-person Life boats and marine evacuation systems shall be arranged on aft part of forecastle weather deck of port and starboard side.

The accommodated box used for Main hook and auxiliary hook to be arranged on aft starboard side forecastle weather deck.

The windlass and mooring systems to be arranged on fore part of forecastle weather deck.

E、A-Deck

Eighteen(18) Four-person living rooms, Bath room, WC, Linen and air conditioning room, Electrical office and engineer office etc. to be arranged in accommodation on A deck.

F、B-Deck

Fifteen(15) Double-person living rooms, Six(6) Single living rooms, Laundry, Linen and air conditioning room etc. to be arranged in accommodation on B deck.

G、C-Deck

Captain Office and living room, Chief engineer office and living room, Engineering superintend office and living room, Client representative office and living room, Electrical engineer office, Laundry, Linen, Battery and charging room, air conditioning room etc. to be arranged on this deck.

H、Navigation deck

Navigation & Control room, Meeting Room, Electrical store room to be arranged.

I、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 RINA or CCS.

Main Generator Sets

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

Rated Output..... 1000KW
Rated Revolution..... 1000Rpm
Voltage and Frequency400V, 50HZ
Diesel Engine Output 1053KW
Diesel Engine Revolution..... 1000Rpm

Shore Diesel Generator

Two(2) sets shore generators shall be provided in engine room, main parameters are :

Rated Output..... 250KW
Rated Revolution..... 1500Rpm
Voltage and Frequency400V, 50HZ
Diesel Engine Output273KW
Diesel Engine Revolution..... 1500Rpm

Emergency Diesel Generator

One (1) set emergency generators shall be provided in emergency generator room on main deck , main parameters are :

Rated Output..... 200KW
Rated Revolution..... 1500Rpm
Voltage and Frequency400V, 50HZ
Diesel Engine Output240KW
Diesel Engine Revolution..... 1500Rpm

Rudder Propeller

Driven by..... Diesel Engine, 360 degree revolving
Output..... 746KW
Revolution 1800 r/min

1.7、 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, have non-slip painted surface, a landing net, marking in contrast colors, beacons, flood lights, wind socks etc. shall be in accordance

with the requirements relevant rules.

The helideck will be of steel structure with stiffened plates and supporting structure will be of lattice type with foundation integral with top of accommodation deck.

The helicopter reception room shall use the Meeting room arranged in navigation house.

Two ways of escape shall be provided as far as apart as possible.

The Deck will be surrounded by a drain gutter and a safety net 1.5m in width. The gutter will be fitted adequate drain points, connected drain pipes, which will be extended to the level below the forecastle deck.

The deck shall have recessed tie-down points for helicopter, the recessed tie-down points connect to drain pipes.

1.8、 Tank Capacity

Fresh Water Tanks

Fresh water Tank (P/S)	2×819.2 m ³
Total	1638.4m ³

Drink Water Tanks

Drink Water Tank (P/S)	2×539.6 m ³
Total	1079.2m ³

Fuel Oil Tanks

Fuel Oil Tank(P/S)	2×611.0 m ³
No.1 Fuel Service Tank(P)	8.8m ³
No.2 Fuel Service Tank(P)	8.8m ³
Fuel Oil Overflow Tank.....	90.3m ³
Fuel Oil Settling Tank	11.9m ³
Total	1341.8m ³

Lubricated Oil Tank

Lub Oil Storage Tank(P).....	12.9m ³
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Special Purpose Tanks

Sewage Tank(P)	220.4m ³
Bilge Tank(P).....	67.7m ³
Dirty Oil Tank(P).....	64.5m ³
Dirty Water Tank(P)	206.4m ³
Sludge Tank(P)	21.5m ³

Cooling Water Tank/Water Ballast Tanks

No.1 Cooling Water /Water Ballast Tank(P)	829.4m ³
No.1 Cooling Water /Water Ballast Tank(S)	836.6m ³
No.2 Cooling Water /Water Ballast Tank(P/S) ...	2×681.6m ³
Total.....	3029.2m ³

Water Ballast Tanks

Fore Water Ballast Tank(P/S)	2×487.8m ³
Fore Water Ballast Tank(C)	922.5m ³
No.1 DB Water ballast Tank(P/S).....	2×505.9m ³
No.1 Side Water ballast Tank(P/S)	2×548.2m ³
No.2 DB Water ballast Tank(P)	681.6m ³
No.2 DB Water ballast Tank(S)	671.9m ³
No.3 DB Water ballast Tank(S)	681.6m ³
No.4 DB Water ballast Tank(P/S).....	2×681.6m ³
No.4 Side Water ballast Tank(P/S)	2×836.5m ³
No.5 Side Water ballast Tank(P/S)	2×837.6m ³
No.6 DB Water ballast Tank(P)	421.1m ³
No.6 DB Water ballast Tank(S)	411.5m ³
No.6 Side Water ballast Tank(P/S)	2×824.9m ³
No.7 Side Water ballast Tank(P/S)	2×259.5m ³
Total.....	13754.2m ³

1.9、 Tonnage

The gross tonnage is about 17282; net tonnage is about 5185.

1.10、 Freeboard and Stability**1.10.1、 Freeboard**

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

1.10.2、 Intact Stability

The intact stability under lift operation shall be carried out in accordance with RINA "Steel Vessel Rules 2010" Part E(III) Chapter 19 Section 2.2.

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
- ※ 900t×30m Aft lift Before or in Operation(100% and 10% Consumptions)
- ※ 900t×24.5m Aft lift Before or in Operation(100% and 10% Consumptions)
- ※ 400t×30m 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 for unrestricted worldwide service and can operate at permitted conditions within 200 miles from Shore

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 5.25m, 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 5°; trim angle is 3°.

The Cooling water/Water ballast tanks shall be full for all transit and operation conditions of vessel to ensure that internal cooling water to be sufficient to engines all the times.

1.10.3、 Damage Stability

The damage stability to be conducted as per requirements of 《The Code of Safety for Special Purpose Ships》 IMO Res A266(84)(2008 SPS Code).

The number of special personnel to be under two hundred (200).

1.11、 Vibration

Special attention is to be paid in design and construction of the vessel to prevent undue vibration.

The design target of vibration level in the accommodation space including wheelhouse is to be within the “COMMONLY ACCEPTED ZONE” (shaded zone) of ISO 6954 “Guidelines for Overall Evaluation of Vibration in Merchant Ships”.

The vibration measurement is to be carried out in accordance with the Builder’s practice when the vessel is running at the continuous service output of the main generators.

Adequate measures are to be taken to prevent local vibration in engine room (generator platform, compressor, pumps, seats of equipment, engine control room).

1.12、 Noise

The Builder is to make their best effort to keep the noise level in the accommodation space and engine room within the following values, which are based upon IMO Resolution A.468 (XII) "Code on Noise Levels on Board Ships". (Tolerance margin of 3 dB (A) is to be allowed in addition to the following values.)

Engine room	110 dB (A)
Engine control room	75 dB (A)
Workshop	85 dB (A)
Wheelhouse	65 dB (A)
Cabin and Hospital	60 dB (A)
Offices	65 dB (A)
Mess room	65 dB (A)

Noise level measurement is to be carried out during the on board test when running at the continuous service output of the main generators at normal operating condition and all fans running.

Noise level is to be measured for one (1) point per room at the near center and 1.2 meters above floor in general.

Measuring methods are to be in accordance with the Builder's practice and the measuring equipment is to be in accordance with GB (Chinese Standard)

The test procedure of noise level measurement is to be submitted to the Owner for approval.

If the measured noise level exceeds the above values, the necessary improvement is to be made to a practical extent mutually agreed between the Owner and the Builder before delivery.

All engine room alarms are to be clearly audible above the noise of the running engine room machinery.

1.13、 Inspection & Quality Control

The Vessel shall be constructed and equipped in accordance to this specification 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. Spill oil shall be removed promptly. Garbage shall be removed daily. Smoking shall not be permitted on board. Lighted access shall be provided throughout.

The items of inspections are to be submitted by the Builder to the Owner's representatives for approval before commencement of project. The Builder is to provide schedule of test, inspections for attendance of the Owner's representatives. All works are to

be carried out to the satisfaction of Owners representatives.

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 Chinese Shipbuilding Standard(CSQS-2005) and Builder's standards, which shall be approved by class and owner shall be used as building standards.

1.14、 Materials and Workmanship

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

The structural steel materials of main hull to be of quality in accordance with specification, requirements of class and approval comments.

Any item accidentally and physically damaged is to be removed and renewed in its entirety.

Associated instruments, gauges or metering devices must be of good quality, fit for the intended purpose, non-corrodible and delineated in metric or S.I. units.

Asbestos shall not be used and "asbestos free certificate" to be provided.

All workmanship for the vessel is to comply with the Builder's standard and good international shipbuilding practices. The Builder is to submit Builder's workmanship / standard for Owner's approval.

1.15、 Plan

1.15.1、 Approval Drawing

All plans required by Class due to changes in Class rules and IMO under this specification will be submitted for approval to Class and Owners.

Prior to starting work, the Designer shall submit the specified working plans to the Owner and Class for approval in due time of design and construction schedules.

The list of the plans for approval shall be mutually agreed between the Owner and the Designer.

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 7 days including mailing time by courier mail, they are to be regarded as approved by the Owner without any comments.

The designer will amend/incorporate the owner's and builder's into the drawings and thereafter, submit to the class for approval.

Electronic-format approval to Class shall be conducted.

1.15.2、 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.

1.15.3、 As-Built Plan

At the time of delivery of the Vessel, the Builder or designer shall furnish to the Owner with three (3) copies of each finished plan and three (3) copies of each instruction book.

The lists of finished plans shall be mutually agreed upon owner.

1.15.4、 Framed Drawings

Following plans, one (1) copy each, mounted in the frames with glass shall be installed aboard 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、 Test and Trial

1.16.1、 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 Builder shall submit to the Owner and/or Class the detailed schedule or memorandum for the test items mentioned hereinafter in due time prior to those tests.

The Owner's representative shall attend the inspections and tests as necessary if the Owner's representative is unable to attend, such inspections and tests shall be performed in the presence of the Builder's inspector and/or Classification Society's Surveyor if required.

All results to be recorded and presented to the owner and Class surveyors.

1.16.2、 Tightness test

All steel structure to be inspected and tightness to be tested for tanks, bulkheads and superstructure deck and other wet space etc. as required by the Class Rules.

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.

1.16.3、 Shop test

The Vessel's machinery, equipment, fittings, construction and so on shall be tested or checked before installation on board the Vessel at the Builder's yard or the sub-contractor's shops or the manufacturers' factories, etc., according to the requirements of the Classification Society and/or the Builder's Protocol for testing and commissioning and/or the manufacturer's and/or the sub-contractor's standard test schedules.

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

1.16.4、 On-Board Test

After the necessary tests are carried out at the Builder's yard, sub-contractor's shops or manufacturers' factories, etc., the Vessel shall be constructed and equipped with machinery, apparatus and fittings on board.

The construction, machinery, apparatus and fitting shall be checked and examined on board the Vessel to ensure that these are satisfactory for the purpose intended.

The items for which construction tests or onboard tests are necessary shall be inspected and/or tested according to the requirements of the Class and the Builder's Practice.

The Owner's representative and the Builder shall determine the scope of tests or inspections to be attended by the Owner's representative on the basis of the Builder's Protocol for testing and commissioning schedule.

After the main generator and electrical equipment are install on board the Vessel and necessary piping and wiring are fitted, these may be operated prior to sea trials to confirm their satisfactory running.

1.16.5、 Light ship Measurement and Inclining Experiment

The "light ship weight" consists of

- Weight from steel hull
- All machinery and associated fittings
- All electric equipment and associated fittings
- Accommodation including internal fittings
- All safety items
- Water and oil in the pipe lines of main generator systems
- Water in boiler
- Spares and tools recommended by the classification essential for main generators

The light ship weight does not include following

- Water and oil in the tanks including main engine circulating tank
- Spares and tools over and above that listed above
- Owner's supply items

Upon completion except for minor items of work, light weight measurement and inclining test of the Vessel shall be carried out by the Builder at the present of class surveyor and owner.

The light weight measurement shall be carried out by reading the draft of the Vessel, measuring the specific gravity of sea water and by investigation of weight to be added or to be deducted, in the presence of Class surveyor and Owner's representative.

The draft of the Vessel shall be measured at both sides of stem, stern and midship draft marks.

Displacement of the Vessel at this light weight measurement shall be determined by reading the draft-displacement table on the corresponding draft obtained from the measured draft. The correction for trim, heel and deflection of the Vessel and the specific gravity of seawater at the measurement shall be made also.

If any superfluous weight is on board the Vessel or any item belonging to be light weight is not on board the Vessel at the time of the light weight measurement, such a weight shall be corrected by calculation.

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 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.

The inclining test shall be conducted by shifting weight and by appropriate means.

The test may be carried out in the Builder's dock, or in sheltered water near the Builder's yard.

Two times light ship measurement and 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 decided.

The report of light ship measurement and inclining experiment to be approved by class and owner.

1.17、 Sea trial

1.17.1、 General

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

Before Builder request for sea trial, construction and testing of all hull, machinery and electric part has to be completed including all machinery, equipment and systems, all electrical equipment and systems, hull equipment and system including accommodation. Painting work shall be in the final coat stage only on exposed decks, with all other areas complete.

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

The sea trial is to be carried out on the ballast condition of about 5.5m draught.

Two(2) Weeks before conducting sea trial, the test procedure shall be sent to Class and owner for approval.

1.17.2、Steering test

To be performed at 5kn transit ahead driven by tug, steering control command shall be given from the wheelhouse as below, the escape time shall be recorded:

Midship to 35 degree starboard

35 degree starboard to 35 degree port

35 degree port to 35 degree starboard

35 degree starboard to midship

1.17.3、Other Test at Sea

Anchor test: Each anchor is lowered up to five shackles of chain cable under control of hand brake and hoisted by windlass. Hoisting speed, electric current shall be measured.

Adjustment of magnetic compasses

Tests or adjustment of other electrical navigation equipment and instruments

Functioning test of fire fighting equipment

1.17.4、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, double hull, long forecastle, 5-tier deck house and Heli-deck.

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 6.8 meters.

The minimum fore draught 5.25m shall be kept in all service conditions in order that the bottom forward is to be strengthened to be neglected.

The vessel to be designed as crane vessel service in offshore area; the hull has sufficient strength, rigidity and certain safety margin.

All materials required by class shall be have certificate and The steel materials for the hull structure which are not specified by the Classification Society are to be in compliance with the Chinese Industrial Standard (GB) or reputed national standard.

Structural steel, other than grade A, shall have proper identification marking. This marking shall be transferred to all elements after cutting.

Longitudinal frame system is used throughout the main hull and long forecastle, all stiffeners on transverse bulkhead are to be fitted vertically; transverse web frames to be arranged every 4 frame space (3400mm), to support the longitudinal. Transverse frame system is used in deckhouse.

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

Non-tight structural members are to be provided with adequate access/lightening holes in accordance with the shipbuilding practice, where necessary or practical, unless they are detrimental to the structural strength of the members.

The structural details such as drain hole, air hole, cutout and slots etc shall follow the Typical Construction Detail (BT922-110-21) and meet Classification Society requirements.

The Class rules for structural design and evaluation shall be as per “RINA and CCS steel vessel rules” .

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. The welding materials (e.g. the welding rod) shall be approved by the Classification Society.

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

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.

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 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.

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.

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

2.3 Keel

A flat plate keel 20 mm thick, 2350mm wide to be arranged throughout the length, and to be tapered at the forward end to the stem.

2.4 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 by the Classification Society.

The shell plating with a large opening such as sea chest, etc. is to be elliptical opening or equivalent.

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

All shell plates to be welded, with bottom plates 20mm, bilge plates 20mm, side plates 17mm, sheer-strake 18mm except in ice reinforcement region, where side plates are 20mm.

All shell plates to be grade "A" except keel and side plate in ice region which to be grade "B".

2.5 Deck plate

The uniform main deck load is 7.5t/m².

Main deck to be longitudinal frame system, constituted by longitudinals, longitudinal girders, web beams, with the thickness 18mm, 15mm (grade "A", grade "B"), 18mm

(stringer, grade “B”).

Deck plates to be arranged longitudinally, without camber and shear.

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.

2.6 Bulkheads

Seven transverse bulkheads to be provided in main hull, up to the main deck, at Fr8 and Fr146 to be plane bulkheads with stiffeners welded, others are corrugated bulkheads, connect the inner bottom and main deck by stools.

Two longitudinal bulkheads to be provided at position of 2400mm off centerline and 12000mm off centerline from aft to forepeak bulkhead.

Fore and aft peak tanks are to be efficiently stiffened by frames, web frames, stringers, etc.

Scantling of bulkheads as follows:

Fore peak bulkhead:

Thickness 14mm

Stiffeners HP300x11

Bulkhead 2400mm off centerline:

Thickness 14mm 17mm

Stiffeners (aft-part transverse framed) HP320x13

Stiffeners (mid-part longitudinal framed) HP250x12 300x90x11x16 I.A.

300x90x13x17 I.A.

Vertical web \perp 18x800/25x250

Bulkhead 12000mm off centerline:

Thickness 14mm

Stiffeners 350x100x12x17 I.A. 400x100x13x18 I.A. 450x125x11.5x18 I.A.

450x125x11.5x18 I.A.

Non Watertight bulkheads:

Thickness 8mm 10mm 12mm 14mm 16mm

Stiffener HP140x8 HP180x10 HP260x10 HP300x11

Vertical web \perp 15x450/20x150 \perp 18x800/25x250

Deep Tanks:

Thickness 14mm 16mm

Stiffener HP300x11 \perp 12x500/20x200 \perp 18x800/25x250

2.7 Bottom structure

Double bottom except fore peak and aft peak is to be built with longitudinal framing supported by solid floors fitted at adequate spacing. Longitudinal girders are to be arranged at adequate spacing.

Double bottoms are to be utilised as water ballast tanks, cooling water and minor tanks as indicated in the General Arrangement.

The solid floors shall be fitted at every two(2) frame spacing in the middle part of vessel, and one floor shall be slight stronger than other one.

Single bottom structure:

Web frames \perp 18/25x250

Girder \perp 18/25x250 \perp 18/25x380

Bottom long'ls. HP320x13 L500x11.5/150x18

Double bottom: Height 2400mm

Center girder 14mm 18mm

Side girder 12mm 14mm

Solid floor 12mm 14mm

Inner bottom 20mm

Bottom long'ls. L11.5x500/18x150 HP320x13

Inner bottom long'ls. L13x400/18x100

Web beam \perp 14x800/18x200

2.8 Double Side Structure

Double Side Structure to be longitudinal frame system with web frames support at every 4 frame spaces:

Side long. in mid and aft part 450x125+11.5x18 I.A. 400x100+13x18 I.A.

350x100+12x17 I.A.

Side long. in fore part(include ice region) HP200x10 HP300x10

Thickness of solid floor 12mm 14mm

Stiffeners of solid floor FB150x12 FB250x14

2.9 Deck structure

Deck longitudinals to be supported by web beams and continuous in the ship length as far as possible.

Longitudinal girders to be arranged to ensure longitudinal strength.

Web beam space of main deck is 3400mm.

Main deck:

Pillar	H18x400/2(20x400)	H14x300/2 (18x300)
Web beam	⊥ 18x800/25x250	
Girder	⊥ 18x800/25x250	
Long's	HP320x13	HP300x11

2.10 Superstructure and deckhouse

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

Decks of the forecastle are to be stiffened by longitudinals, transverse deep beams and girders.

The boundary walls of the deckhouse are to be a plane type with suitably spaced vertical stiffeners and watertight construction.

Division walls of sanitary spaces, refrigerated spaces, etc. are to be of steel stiffened by suitably spaced corrugations and/or flat type division with stiffeners generally to be 6 mm in thickness, but higher thickness may be applied where required based on vibration and good design practice.

The edge of deck plating of aft deckhouse is to be extruded from outside boundary walls by about 10~15 mm except the top deck and superstructure front exposed bulkhead.

Special attention is to be given to the design of structure to minimise uncomfortable/adverse vibration.

In wet areas and exposed decks, only full welding to be applied and intermittent welding should not be carried out.

Forecastle structure:

Shell plate thickness	12mm	
Deck plate thickness	12mm	18mm
Long's	L160x100x10	HP260x10
Web beam	⊥ 10x500/12x200	⊥ 12x650/16x200
Girder	⊥ 10x500/12x200	⊥ 12x650/16x200

Deckhouse structure at first layer:

Thickness of deck	10mm
Thickness of front Wall	6mm
Thickness of other Walls	6mm
Stiffeners of front Wall	L125x80x8
Stiffeners of other Walls	L100x80x6
Deck girder	⊥ 12x300/16x150
Web beam	⊥ 12x300/16x150
Deck beam	L125x80x8

Deckhouse structure at second layer or higher:

Thickness of deck	8mm
Thickness of bulkhead	6mm
Stiffeners of Wall	L100x80x6
Deck girder	⊥ 8x300/10x150
Web beam	⊥ 8x300/10x150
Deck beam	L125x80x8

2.11 Helideck

The helideck will be of steel structure with stiffened plates and supporting structure will be of lattice type with foundation integral with top of accommodation deck.

The Helideck shall be designed as Class rules and CAP437 regulation.

2.12 Ice Class Strengthening

Ice strengthening design shall be as per Chinese Classification Society(CCS) of Class B.

2.13 Foundation

The generator foundation to be welded structures with enough strength on inner bottom. Thickness of web plate to be 20mm when face plate to be 25mm.

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.

2.14 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 outside shell.

2.15 Bilge keel

Continuous bilge keel to be arranged in bilge area to the extent of about 1/3 length of the vessel, which is constituted by flat steel and Bulb plate of 400x16mm.

Each bilge keel is to be of a rolled section type and the edge of the web plate of the bulb plate is to be welded to a flat pad plate and attached onto the bilge strake by welding, and gradually disappear at the end.

2.16 Bulwark

Steel bulwarks of about 1.05 meters high with top rails and stays are to be fitted to forecastle as indicated in the General Arrangement.

2.17 Skegs

Two Skegs to be arranged at 2400mm off center line in the aft to improve steady course stability use.

The skegs shall be all welded structures, the outside plate to be 16mm.

2.18 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.

Strength analysis shall be conducted as per CCS 《Rules for Lifting Appliances of Ships and Offshore Installations》

2.19 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 Ships” (2010) of RINA. All the anchors, anchor cable and mooring equipment are to be made of approved materials with RINA or 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, each 6525kg, one as spare.

Anchor chain: 632.5m Stud-link chain cable 73 mm in diameter grade Q3
11 shots for left chain and 12 shots for right chain.

Windlass: with single gypsy, one mooring drum, single warping head.

Working load: 253kN Supporting load: 1800kN

Drum load: 100kN Drum capacity: $\Phi 70 \times 200\text{m}$ (Fiber rope)

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

3.2. Mooring equipment

3.2.1 Mooring rope & Towing rope

Six mooring rope: $\Phi 70\text{mm} \times 200\text{m}$, 8-Polymide rope. Minimum breaking load 481kN.

One towing rope: $\Phi 56\text{mm} \times 260\text{m}$, $6 \times 37 + \text{FC1570}$ galvanized steel rope. Minimum breaking load 1471kN.

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

3.2.3 100kN Hydraulic winch

Two 100kN hydraulic winches is installed on both sides of the astern deck. The two winches can work at the same time.

Duty pull: $100\text{kN} \times 15 \text{ m/min}$

Drum capacity: 200m×Φ20 DIA. SWR

Holding load: 150kN

3.3. Towing equipment

Towing equipments is equipped to satisfy towing speed of 7kn in still water. Four towing brackets and four the closed chocks is installed on the forecastle deck. Two sets of towing bridles to be installed. Each set consists of two long chain, one triangle plate, one short steel rope, one shackle and retrieving rope. One 10t reel winch to be installed 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

3.4.1 Requirements

Position anchor equipments comply with eight points anchor mooring system. Position anchor winch is installed in the four winch room aft and fore of the port and starboard ship. Anchor cable is lead to the main deck and forecastle deck with guiding sheave, lead off the ship through fairlead, connect to the position anchor.

3.4.2 Anchor

Eight delta anchor, each 8000 kg .

3.4.3 Anchor cable

Eight Ø62mm×1500m galvanized steel rope. 6×49 SWS+IWR, breaking load 2150kN. Q3 Anchor chain of Ø56mm connect anchor and anchor cable. The length of anchor chain is approximately 5m.

3.4.4 Position anchor winch

Eight electrical driven winches is installed to the ship. The winches can be controlled nearby and also in the wheelhouse.

Specification of the winch as follows:

Rated pull: 750kN (3rd layer)

Speed: 0~10 m/min (when the pull is 750kN)

Light pull: 300kN (3rd layer)

Speed: 0~20 m/min (when the pull is 300kN)

Light pull: 100kN (3rd layer)

Speed: 0~50 m/min (when the pull is 100kN)

Holding load: 2200kN (3rd layer)

Drum capacity: Ø62mm×1500m

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;

3.5. Mast & signal

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

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

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

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

after mast light is arranged on the 900t crane top

3.6. Crane

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

3.7. Ladder, railing, manhole cover & hatch cover

3.7.1 Interior stairs

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

3.7.2 Exterior ladders

Inclined ladders outside deckhouse and leading to machinery space should be of steel and not less than 700mm in width.

3.7.3 Vertical ladder

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

3.7.4 Railing

Railing of $\Phi 114 \times 6\text{mm}$ should be arranged on main deck. Railing of $\Phi 42.25 \times 3.25$ should be arranged on each deck. The height of railing is 100mm.

3.7.5 Handrail

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

3.7.6 Manhole cover

Manhole cover of watertight type or oil tight type should be arranged on main deck, platform 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.

3.7.7 Hatch cover

One watertight hatch cover of 2000X2000mm should be arranged for engine shop on the starboard side.

Two watertight hatch covers of 3200X2500mm should be arranged for engine room.

Two weather tight hatch cover of 830X830mm should be arranged for the port and starboard of the propeller tank and the winch tank as escape route.

The weather tight hatch cover of 830X830mm should be arranged for engine room as escape route.

One weather tight hatch cover of 830X830mm should be arranged for hawser store.

3.8. Door

3.8.1 Watertight Door

Hydraulic sliding watertight Door be used between engine room & engine shop on the double bottom, Width of door is 700mm. this door can be handled manually at both side of engine room move over ,hydraulic pipes will be laid for manual hydraulic handling and the handle installed on 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; the wire mesh door is provided at the CO₂, C₂H₂, O₂ room. Width of door as main passage should not less than 800mm. Width of wire mesh door is 700mm.

3.8.3 Cabin' doors

Cabin's door should comply with the fire-resisting class of bulkheads wherein. Width of doors is 700~900mm.

Door of engine control room must be the steel soundproof airtight door. Width of the door is 700mm.

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 storm cover should be arranged below forecastle deck.

3.9.3 Rectangular window

Welding rectangular windows of 400X650mm should be arranged on forecastle deck, deck A, deck B, deck C.

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.

3.9.5 Fire resistance service window

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

Fire resistance service window of 900x630mm should be arranged between the galley and the corridor.

3.10. Fire fighting equipment

The fire precaution, fire extinguishing and fire fighting apparatus shall be provided in compliance with the SOLAS 2009, 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 SOLAS 2009 requirements to passenger ship.

Each one closed life craft is equipped on both sides of the A deck. This is also as rescue boats to have capacity of 75 persons, gravity-type boat davit, electric life-saving/rescue

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

3.12.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 including 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 safe.

Perimeter safety netting of 1.5 width 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 safe.

Tie-down equipments 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 to be arranged along the perimeter of helideck and to be connected to the sewage tank.

3.13.Fender

Tire fenders to be arranged both sides of the ship 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.

3.14.Painting and corrosion control

All the painting works should adopt paint products of high quality adapting to the circumstances . 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.

3.15.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.

3.16. Accommodation arrangement

3.16.1 Accommodation

The arrangement of accommodation to satisfy the requirements of 68 crew and 130 special personnel.

Accommodation for crew

1 man suite (with toilet unit)	2 (~25m ²)
1 man suite (with toilet unit)	6 (~18m ²)
1 man cabin (with toilet unit)	7 (~11m ²)
2 men cabin (with toilet unit)	15 (~15m ²)
4 men cabin (with toilet unit)	6 (~15m ²)

Accommodation for special personnel

1 man cabin (with toilet unit)	2 (~11m ²)
4 men cabin	32 (~15m ²)

3.16.2 Accommodation equipments

A. 1 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
- 1 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 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 toilet unit
- 1 exclusive use lamp
- Coat 1 hooks, curtain, etc

F. Office

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

G. Big conference room(120P)

- 1 conference table
- 28 high class upholstered arm chairs
- 8 upholstered sofas
- Resultant cabinet
- 1 LCD TV
- 1 miniature acoustics
- 1 DVD
- 1 Drinking Water Fountain Cold/Hot
- 1 White Board
- 1 coffee table, etc.

H. Small conference room(12P)

- 1 conference table
- 12 high class arm chairs
- 1 upholstered sofas
- 1 LCD TV
- 1 miniature acoustics
- 1 DVD
- 1 Drinking Water Fountain Cold/Hot
- 1 White Board
- 1 coffee table, etc.

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 miniature 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) 2 garbage can to be equipped to each room. Thermos and rack to be equipped to

room without drink machine.

3.16.3 Galley equipments

No.	Name	Quantity	Remarks
1.	Electric Cooking Range with 6 Oven ~ 28.8 kW	1	With 1 roaster
2.	Electric Tilting Frying Pan (40L) ~ 9 kW	2	
3.	Meat Mincer (220kg/h) ~0.85KW 220V	1	
4.	Mixing Machine (50L) ~ 1.5 kW	1	With Meat twisting head
5.	Dough Mixing Machine (20 kg powder) ~ 2.9kW	2	
6.	Baking Oven ~14.4kW	2	
7.	Deep Fryer ~12KW 380V	2	
8.	Dish Washer (60 basket/h) ~16.1KW 380V	2	
9.	Washing Machine (household) (5kg) 2KW 220V	1	
10.	Sterilized Cabinet (350L) ~ 2.7 kW	2	
11.	Electric Tilting Soup Boiler (60L) ~9KW 380V	3	
12.	Waste Disposer (300-350kg/h) ~2.2KW 380V	1	
13.	Steam Box (42 kg) ~ 12kW 380V	2	
14.	Potato Peeler (15kg) ~0.75KW 220V	1	
15.	Meat Slicer ~0.25KW 220V	1	
16.	Vegetable Cutter ~0.55KW 220V	2	
17.	Pasta Machine (25~30kg/h) ~2.0KW 220V	1	
18.	Electric Pan Cake Toaster ~5KW 380V	1	
19.	Ice Cube Machine ~0.62KW 220V	1	
20.	Refrigerators 500L ~0.45KW 220V	2	
21.	Micro-wave Oven ~1.5KW 220V	2	
22.	Bread Slicer (30 pcs /min) ~0.25KW 220V	1	
23.	Double Sink Table	6	
24.	Stainless Working Table	4	
25.	Stainless Bowlrack	2	
26.	Stainless Bottle Rack	2	

No.	Name	Quantity	Remarks
27.	Stainless Cup Rack	2	
28.	Stainless Condiment Table	2	
29.	Stainless Chopping Table	1	
30.	Stainless Steel Trash Bin	1	
31.	Working Table 1800x800x850	1	
32.	Working Table 1200x650x850	1	
33	Mixing Machine (40L) ~ 1.5 kW	1	
34	Soybean Milk Cooker (80kg/h) 1.1KW 220V	1	
35	Induction Range ~ 2x15 kW	1	
36	Wardrobe 900x500x1800 (双层)	2	
37	Soup Barrel Ø600x600	4	
38	Hoop 3600x900	1	
39	Hoop 6000x900	1	
40	Channel Steel 156x45x3	35m	Stainless Steel
41	Cover of Channel Steel 140x40x3	35m	Stainless Steel
42	Stainless Steel Tableware ark 1200x650x850	1	

3.16.4 Mess equipments

A. Vip mess(1)

No.	Name	Quantity	Remarks
1.	Rack 1800x600x850	1	
2.	Drinking Water Fountain Cold/Hot 0.75KW	1	
3.	Dinning Table φ 1600x850	2	
4.	Arm chair	16	

B. Vip mess(2)

No.	Name	Quantity	Remarks
1.	Rack 1800x600x850	1	
2.	Drinking Water Fountain Cold/Hot 0.75KW	1	

3.	Dinning Table ϕ 1600x850	2	
4.	Arm chair	24	

C. Mess

No.	Name	Quantity	Remarks
1.	Insulation Table (4 frames) ~ 4 kW	3	
2.	Rack 2300x600x850	1	
3.	Soap barrel	2	
4.	Drinking water fountain Cold/hot 0.75KW	1	
5.	Electric Water Boiler (42L)	1	
6.	LCD Screen TV	2	
7	Dinning table 2400x700x750	16	
8	Bench 2200x300x450	32	
9			

3.16.5 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	Quantit	Remarks
1.	Water closet	1	vitreous china wall hang with open seat & flush valve type w.c and Insulation water box
2.	Washbasin(with 800X500 marble floor)	1	With 1set faucet, S-type trap, pipe, valve
3.	Shower	1	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

No.	Name	Quantit	Remarks
8.	Toilet paper rack	1	Stainless steel or chrome plated brass
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.	Buzzere (or speaker)	1	
17.	Exhaust valve	1	

3.16.6 Washroom

Sanitary appliances of public toilets can be equipped as follows:

No.	Name	Quantity	Remarks
1.	Water closet	30	With flashing valve
2.	Urinal	4	With flashing valve
3.	Washbasin	3	With 2set faucet, S-type trap, pipe, valve
4.	Sink	4	With 1set faucet, pipe, valve
5.	Mirror	9	GRP lace
6.	Soapbox	9	Stainless steel or chrome plated brass
7.	handrails	30	Stainless steel or chrome plated brass
8.	Toilet paper holder	30	Stainless steel or chrome plated brass
9.	Hat and coat hook	60	Stainless steel or chrome plated brass
10.	Wastebasket	30	Stainless steel or chrome plated brass
11.	Partition Board	N.	
12.	Washbasin	1	With 3set faucet, S-type trap, pipe, valve

3.16.7 Bathroom

Equipments of bathroom can be equipped as follows:

No.	Name	Quantity	Remarks
1.	Washbasin(with 800X500 marble floor)	2	With 1set faucet, S-type trap, pipe, valve
2.	Shower and accessory	30	With thermostatic mixing valve, hose, sprinkler etc.
3.	Mirror	5	GRP lace, water-fog proof
4.	Soap box	35	Stainless steel or chrome plated brass
5.	handrails	30	Stainless steel or chrome plated brass
6.	Multi-layer towel hanger	4	Stainless steel or chrome plated brass
7.	Towel hook	60	Stainless steel or chrome plated brass
8.	Bench	3	Wooden
9.	2-door Wardrobe	5	Stainless steel
10.	3-door Wardrobe	2	Stainless steel
11.	Partition Board	N.	
12.	Washbasin(with 800X500 marble floor)	1	With 3set faucet, S-type trap, pipe, valve

3.16.8 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	7	market
3.	Dryer	5	market
4.	Dryer Ark	4	
5	Others		

3.16.9 Changing room

Wardrobes is equipped to the changing room.

3.16.10 Store and tool store

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

3.17. 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.

3.18. 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 of face cover 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 to be GRP plate.

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

3.20. Marking

Funnel mark, snips name, home port, bulkhead marks, deep load line marked with successive welding and painted.

Part IV MACHINERY

4.1 General Description:

The machinery and piping system are to be compliant with the Rules and Regulations of the Classification Society.

All machines and equipments are to be suitable for marine use.

The engine room located middle ship of the vessel. The machinery, equipment, tanks, etc. are to be arranged in good order in the engine room, as shown in the drawing of Machinery Arrangement in Engine Room.

Diesel engines are to be based on the following conditions:

Sea water temperature	32 °C
Ambient air temperature	50 °C (Engine Room)
Relative humidity	60 %
Atmospheric pressure	0.1 MPa

All engines, except for emergency diesel gen-set, are to be conforming to the IMO-NOX regulation for environmental protection.

The generator engine and rudder diesel engine are burning marine diesel oil. Marine diesel oil having a viscosity of up to 11 mm²/s(cSt) at 40°C and a flash point of not less than 60°C.

4.2 Particulars of Machinery Part:

4.2.1 Generator Equipment:

The electric generating system shall consist of three (3) sets main generators and two (2) sets harbor generator and one (1) sets emergency generator. Capacity of generator is to be subjected to the final electric load analysis.

1) Main Generator:

Number:	3 sets,
Rating power:	1000 kW, 400 V, 50 Hz, 3 phrase,
Rating rotation speed:	1000 rpm,
Main generator diesel engine:	
Type:	Vertical, 4-stroke, medium speed, direct fuel injection, non-reversible, turbo-charged, marine diesel engine.
Rating power:	1053 kW,

Rating rotation speed: 1000 rpm,

2) Harbor Generator:

Number: 2 sets,

Rating power: 250 kW, 400 V, 50 Hz, 3 phrase,

Rating rotation speed: 1500 rpm,

Main generator diesel engine:

Type: Vertical, 4-stroke, high speed, direct fuel injection, non-reversible, turbo-charged, marine diesel engine.

Rating power: 273 kW,

Rating rotation speed: 1500 rpm,

3) Emergency Generator:

Number: 1 sets,

Rating power: 200 kW, 400 V, 50 Hz, 3 phrase,

Rating rotation speed: 1500 rpm,

Main generator diesel engine:

Type: Vertical, 4-stroke, high speed, direct fuel injection, non-reversible, turbo-charged, marine diesel engine.

Rating power: 240 kW,

Rating rotation speed: 1500 rpm,

4.2.2 Auxiliary propulsion equipment:

For auxiliary location abilities, there have two (2) sets rudder propeller on after ship.

1) Rudder propeller:

Number: 2 sets, (P& S)

Type: 360 degree rotation, vertical installation,

2) Rudder propeller driven diesel engine:

Type: V-type, 4-stroke, high speed, direct fuel injection, non-reversible, turbo-charged, marine diesel engine.

Rating power: 735kW, 1800 rpm

4.3 Piping System for Machinery:

4.3.1 Fuel Oil System:

4.3.1.1 Main equipment and tanks:

Item	No set	Pump capacity m3/h	Pressure MPa	Tank capacity m3
Fuel oil transfer pump	2	6	0.4	——
Main generator diesel engine fuel oil circle pump	2	4.0	1.0	——
Fuel oil purifier	1	1500 l/h	——	——
Fuel oil tank (P)	1	——	——	611
Fuel oil tank (S)	1	——	——	611
Fuel oil overflow tank	1	——	——	90
Fuel oil service tank (1#)	1	——	——	8.8
Fuel oil service tank (2#)	1	——	——	8.8
Fuel oil setting tank	1	——	——	11.9
Emergency generator diesel engine service tank	1	——	——	3
Rudder propeller diesel engine service tank (P)	1	——	——	2
Rudder propeller diesel engine service tank (S)	1	——	——	2
Incinerator service tank	1	——	——	1

4.3.1.2 System description: (attach see piping diagram):

Filling of fuel oil is to be located on bunkering station on main deck (P&S). In the bunkering station, there have fuel oil filling joint and filling valves. A flow meter with bypass is to be located in the delivery line of transfer pumps. On the filling pipes, there to be has one pressure valve for protected over pressure for the pipes. The over pressure oil will drain to fuel oil overflow tank.

Fuel oil transfer among fuel oil bunker tanks in the hull construction is to be served by the fuel oil transfer pump. The fuel oil transfer pump can lead oil to the fuel oil service tank and fuel oil setting tank.

The main generator fuel oil service system is to consist of the F. O. circle pump, attached fuel oil pump, a duplex suction strainer and diesel oil service tanks. The return oil from the engines is to be led to the tanks as required

The same diesel oil service tank is to be used for the harbor generator engine also.

The emergency generator diesel engine, rudder propeller diesel engine and incinerator have independent service tank.

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

Drain and sludge oil to be collected in a dirty oil tank from which provision to be made for pumping ashore through an international shore connection.

4.3.2 Lubricating oil system:

4.3.2.1 Main equipment and tanks:

Item	No set	Pump capacity m3/h	Pressure MPa	Tank capacity m3
Lub. Oil transfer pump	1	3.6	0.2	——
Lub. Oil storage tank	1	——	——	12.9

4.3.2.2 System description: (attach see piping diagram):

Enclosed lube oil system for the diesel engine as per engine maker to be provided. Filter as per maker recommendation to be provided.

Each generator diesel engines is to be lubricated by its own lub. oil system consisting of the pump and the cooler.

The L.O. transfer pump is to serve for transferring lub. oil from L.O. storage tank to each main generator diesel engine.

Filling of LO is to be located on bunkering station on main deck (P&S).

Lub. oil drains from the machinery are to be collected into the dirty oil tank. The dirty oil tank has high level alarms.

4.3.3 Cooling water system:

4.3.3.1 Main equipment and tanks:

Item	No set	Pump capacity m3/h	Pressure MPa	Tank capacity m3
Main cooling sea water pump	2	110	0.32	——
Main heat exchanger	2	——	——	——
Main generator fresh water expansion tank	1	——	——	1
Sea cooling water pump for air conditioner	3	120	0.34	——
Sea cooling water pump for refrigerate plant	2	30	0.32	——
Sea water cooling pump for winch	2	100	0.32	——

Fresh water cooling pump for winch	2	60	0.35	—
Heat exchanger for winch	2	—	—	—
Expansion tank for winch fresh cooling water	1	—	—	1.0
Rudder propeller hydraulic unit sea water cooling pump	2	20	0.30	—
Rudder propeller sea water cooling booster pump	2	28	0.20	—

4.3.3.2 System description: (attach see piping diagram):

a) Main generator engines cooling system:

Sea water cooling system:

Main generating engines are to be cooled by fresh water through engine built-in fresh water pump and independence heat exchanger, in which the fresh water cooled by independence sea cooling water pump.

There have two sea water cooling pump built in the system. Normally one is in use and the other is in standby.

The sea water pumps to take sea water from sea chests through sea water main pipe with sufficient diameter and discharge overboard through the heat exchanger.

Two (2) sea chests shall be arranged in engine room each on PS and SB and connected by a sea water main through sea chest valve, a strainer and a gate valve.

Each sea chests to have sufficient flow area required by rule and to be equipped with air blow tube, protect grids and zinc block.

The sea water pump can also take sea water from sea water cooling tanks and discharge back to the tanks through heat exchanger.

Fresh water cooling system:

The fresh water to be cooled through heat exchanger with galvanized steel casing and copper tube.

One (1) fresh water expansion tanks to be provided in E/R casing for supplement of fresh water in the system. The engine built in fresh water cooling pump circling the fresh water through heat exchanger and engine.

The main engine cooling fresh water system is to be composed of its own cooling water circuit providing with exclusive use cooling fresh water pump and temperature control valve. The engine internal cooling water system is separated hot temperature (HT) water system and low temperature (LT) water system. Each engine has built in HT water cooling pump and LT water cooling pump.

b) Harbor generator engines cooling system:**Sea water cooling system:**

Harbor generating engines are to be cooled by fresh water through engine built-in fresh water pump and engine built in heat exchanger, in which the fresh water cooled by engine built in sea cooling water pump.

The engine built in sea water pumps to take sea water from sea chests through sea water main pipe with sufficient diameter and discharge overboard through the heat exchanger.

The sea water pump can also take sea water from sea water cooling tanks and discharge back to the tanks through heat exchanger.

Fresh water cooling system:

The fresh water to be cooled through heat exchanger with galvanized steel casing and copper tube.

The harbor generator engine cooling fresh water system is to be composed of its own cooling water circuit providing with exclusive use cooling fresh water pump and temperature control valve and heat exchanger.

c) Rudder propeller engines cooling system:**Sea water cooling system:**

Rudder propeller engines are to be cooled by fresh water through engine built-in fresh water pump and engine built in heat exchanger, in which the fresh water cooled by engine built in sea cooling water pump.

The engine built in sea water pumps to take sea water from sea chests through sea water main pipe with sufficient diameter and discharge overboard through the heat exchanger.

The sea water pump can also take sea water from sea water cooling tanks and discharge back to the tanks through heat exchanger. There have one booster pump in the discharge pipe for keep the discharge water pressure.

Fresh water cooling system:

The fresh water to be cooled through heat exchanger with galvanized steel casing and copper tube.

The rudder propeller engine cooling fresh water system is to be composed of its own cooling water circuit providing with exclusive use cooling fresh water pump and temperature control valve and heat exchanger.

d) Air conditioner and refrigerate equipment cooling system:

There have one (1) set sea cooling water pump for air conditioner compressor cooler and refrigerate compressor cooler.

The pump will take the sea water from main sea cross water pipe and discharge overboard through compressor cooler.

e) Winch cooling water system:**Sea water cooling system:**

Winch cooler are to be cooled by fresh water through fresh cooling water pump and independence heat exchanger, in which the fresh water cooled by sea cooling water pump.

There have two sea water cooling pump built in the system. Normally one is in use and the other is in standby.

The sea water pumps to take sea water from sea chests through sea water main pipe with sufficient diameter and discharge overboard through the heat exchanger.

The sea water pump can also take sea water from sea water cooling tanks and discharge back to the tanks through heat exchanger.

Fresh water cooling system:

The fresh water to be cooled through heat exchanger with galvanized steel casing and copper tube.

One (1) fresh water expansion tanks to be provided in E/R casing for supplement of fresh water in the system. Fresh water cooling pump will circle the fresh water through heat exchanger and cooler.

4.3.4 Compressed air system:**4.3.4.1 Main equipment and tanks:**

Item	No set	Pump capacity m3/h	Pressure Mpa	Tank capacity m3
Main air compressor	2	48	3.0	——
Main air reservoir	2	——	3.0	1.0
Emergency air compressor	1	1.6	2.6	——
Emergency air reservoir	1	——	3.0	0.16
Service air compressor	2	20	1.0	——
Service air reservoir	1	——	1.0	1
Air horn air reservoir	1	——	1.0	0.32
Quick close valve control box	1	——	1.0	40L

4.3.4.2 System description: (attach see piping diagram):**a) Starting compressed air system:**

The starting compressed air system is to be provided for starting of the main generator engine.

The system is to consist of two (2) main air compressors and two (2) main air reservoirs. The system is 30 bar pressure line. Main Air Reservoirs to have safety/relief valves, as required by class.

There have pressure control between air compressor and air reservoir for automatic start/stop air compressor.

The outlet of the main air reservoir is to be led as follows:

- To main generator engines
- To emergency generator starting system
- To service air reservoir/air horn reservoir through pressure reducing valve

b) Service compressed air system:

Sufficient number of service air outlets to be provided on each deck and in engine room for maintenance. The service air connections are to be provided with a shut off valve and quick connects couplings.

Service air line:

- To hose connections for general service in machinery space such as cleaning service
- To deck service
- To emergency connection to the sewage treatment plant
- To hydraulic tank
- To sea water chests
- To quick close valve control box
- To pump self-suction equipment

c) Air horn compressed air system:

The pipes can lead compressed air from air horn reservoir to WD-2 type air horn.

d) Emergency generator compressed air system:

The starting compressed air system is to be provided for starting of the emergency generator engine.

The system is consisting of one (1) set emergency air compressor and one (1) set emergency air reservoir.

The emergency air reservoir can be filling with manual emergency air compressor and also can be filling air by main air reservoir.

e) Quick close valve system:

A quick close valve system will be mounting on the vessel for emergency shut down the fuel oil tank's outlet valves as required by class.

The system is consisting of one (1) quick close valve control box and pneumatic quick close valves.

The quick close valve control box will built in one (1) air bottle with safety/relief valves

and built in air branch which lead air to the quick close valve.

4.4 Hull Piping System:

4.4.1 Bilge System and Dirty Oil system:

4.4.1.1 Main equipment and tanks:

Item	No set	Pump capacity m3/h	Pressure MPa	Tank capacity m3
Bilge pump	3	130	0.18	——
Engine room bilge pump	1	30	0.365	——
Bilge water tank	1	——	——	67.7
Dirty oil tank	1	——	——	64.5
Dirty water tank	1	——	——	206.3
Oil water separator	1	——	——	3
Dirty oil pump	1	19	0.6	——

4.4.1.2 System description: (attach see piping diagram):

a) Bilge system:

Bilge pumping system is to be in accordance with the requirement of the Classification Society.

Void tank, rudder propeller room, winch room below the main deck will be mounting bilge water suction and connected to the engine room bilge water main pipe.

There have three (3) sets bilge water pump which location in the engine room and winch room, these pumps are to have the connection from the bilge water main pipe in the engine room and discharge the bilge water overboard.

There also have one (1) set engine room bilge water pump which location in the engine room, the pump is to have the connection from the bilge main in the engine room which have the bilge suction each with a mud box and a non-return screw down valve at the well. The bilge pump furthermore is to have the connection from the bilge wells and to be discharged to bilge tank. An international bilge shore connection with a stop valve is to be provided at each side of the accommodation house for discharging engine room bilge.

b) Bilge water treatment system:

Bilge water in the bilge water tank are to be take suction by the bilge separator and to be take treatment then to overboard.

Bilge drainage in the engine room also can serve by the bilge pump which built in the bilge separator.

The bilge separator is to be of an automatic oil-discharging type with an oil content alarm device. The bilge pump which built in bilge separator is to be automatically stopped, when oil

content high alarm is energized. The dirty oil after separator will be discharge to dirty oil tank.

In any area can not release the bilge water after separator even it consistency no more than 15 ppm, the bilge water after separator will discharge to the dirty water tank, when sealing to the area not be limited, then discharge to the sea.

c) Dirty oil system:

Oil pan for oil tank, oil pump will be lead to dirty oil tank. The dirty oil will discharge to the deck shore connection through dirty oil pump.

4.4.2 Fire Fighting system:

4.4.2.1 Main equipment and tanks:

Item	No set	Pump capacity m3/h	Pressure MPa	Tank capacity m3
Fire fighting pump	3	100	0.8	—
Fire fighting booster pump	1	2.5	1.2	—
Fire fighting hydraulic tank	1	—	—	1
Engine room carbon dioxide systems	1	—	—	—
Fixed pressure water-spraying fire-extinguishing systems in machinery spaces	1	—	—	—
Foam fire extinguishing system for helicopter deck	1	—	—	—
Fire extinguishing for deeper frying pan	1	—	—	—
Fixed automatic sprinkler system	1	—	—	—

4.4.2.2 System description: (attach see piping diagram):

a) Water fire extinguishing system:

The fire extinguishing pipe line with hose valves, fire hose, nozzles, and necessary equipment is to be provided in accordance with the requirements of the Regulation Bodies.

The fire service is to be served by two three (3) sets fire fighting pumps which two (2) sets located in the engine room and the other one located in the winch room. All fire fighting pumps can supply the fire fighting water to the main fire fighting pipe. The fire hydrant will be arranged following the requirement of the regulation. The isolation valve will be located on the fire fighting pipes outside the engine room.

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.

The fire fighting pump which located in the winch room must have electric source by the emergency generator.

Fire fighting shore connection will be located on the above deck.

Water fire fighting system also supply deck flushing water and anchor chain flushing water.

b) Fixed carbon dioxide 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 system is to consist of carbon dioxide gas bottles, discharge pipes and nozzles, remote control release equipment, alarm system and other equipment required by the rule.

The total quantity of carbon dioxide gas installed on board is to be in accordance with the rule requirement.

The carbon dioxide gas bottles are to be stored in the CO₂ gas bottle room.

The CO₂ total flooding system is to be fitted for engine room and CO₂ gas discharge piping is to be led to the engine room from the CO₂ gas bottle room.

Two (2) separate controls are to be provided in the fire control station for releasing carbon dioxide gas into the engine room and to ensure the activities of the alarm. One (1) control is to be used for discharge the gas from the CO₂ gas bottles. A second control is to be used for opening the valve of the gas discharge piping.

Gas release of carbon dioxide gas bottles is to be carried out manually with the aid of pneumatic pressure.

The system is to be in accordance with the rule requirements.

Compressed air blow-through connection to be provided.

c) Fixed pressure water-spraying fire-extinguishing system in engine room:

Follows IMO 913, a fixed pressure water-spraying fire-extinguishing system is to be applied to the engine room for protect diesel engine, oil boiler.

The fixed pressure water spraying fire extinguishing system shall be provided with spraying nozzles of an approved type.

The number and arrangement of the nozzle shall be to the satisfaction of the administration and shall be such as to ensure an effective average distribution of water of at least 5l/m²/min in the spaces to be protected.

The system shall be kept charged at the necessary pressure and the pump supplying the water for the system shall be put automatically into action by a pressure drop in the system.

d) Foam fire extinguishing system for helicopter deck:

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

There have one set foam tank and one set foam generator which built in foam tank in

engine room.

The foam fire extinguishing system sea water pump can suction the sea water from main sea water pipe. The foam will transfer to the foam gun through foam pipes.

The foam gun will be located on the fore mast which can eject directly to the helicopter deck.

e) Fire extinguishing system for deeper frying pan:

The fire extinguishing system for deeper frying pan will be built on the deeper frying pan bodies.

f) Fixed automatic sprinkler system:

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.

4.4.3 Ballast system:

4.4.3.1 Main equipment and tanks:

Item	No set	Pump capacity m3/h	Pressure MPa	Tank capacity m3
Ballast pump	2	200	0.30	—

4.4.3.2 System description: (attach see piping diagram):

There have twenty two (22) ballast tanks on the vessel.

Ballast water for all ballast tanks to be served by ballast pumps. Shift of water ballast between each water ballast tank should not be considered.

4.4.4 Sewage system:

4.4.4.1 Main equipment and tanks:

Item	No set	Pump capacity m3/h	Pressure MPa	Tank capacity m3
Sewage treatment equipment	2	—	—	100 p/d
Sewage tank	1	—	—	220
Sewage pump	1	36	0.23	—

4.4.4.2 System description: (attach see piping diagram):

a) Deck Scuppers and Drain system:

Flush type deck scuppers are to be provided for the exposed decks.

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.

b) Waste Water system:

Wasted water drains from wash basins, sinks, various galley utensils and scuppers are to be led to the waste water drainage mains. Wasted water drainage main pipe are to be provided for the accommodation space. Wasted water drainage is to have cleaning plug. Waste water are to be led directly overboard.

Scuppers of wasted water are to be located aft and outboard as far as practicable.

Discharge outlets of the waste water to be located below the light ballast water line level.

c) Sewage system:

Soil drain from water closets and urinals is to be directly collected to the sewage treatment plant.

The soil drains are to be treated by the sewage treatment plant and to be discharged overboard through the soil drainage overboard outlet. Soil pipes to be provided with cleaning plugs.

Two (2) sets of sewage treatment plant are to be installed in the engine room for treatment of black water and each is to have a capacity for 100 persons.

Each of the drainage mains and sewage treatment plant is to be properly vented to the open air and to have a sea water connection for flushing and cleaning the system.

The treated soil is to be discharged overboard by the sewage discharge pump attached to the plant, and the overboard discharge from the sewage treatment plant is to be arranged at aft as far away from main sea chest as possible and practicable.

If somewhere cannot discharge the water even after treatment, then discharged the water after treatment to the sewage tank. And discharged by the independent sewage pump to the overboard where it can be discharged.

4.4.5 Filling Sounding and Air vent:

4.4.5.1 Filling pipes:

Filling connections are to be provided as follows.

Item	Number, size, location etc.
Diesel oil	About 100 mm in nominal diameter at each side of the vessel after the accommodation house on upper deck
Lubricating oil	at each side of the vessel
Fresh Water	About 100 mm dia on each side

Each filling connection is to be provided with a valve and a steel blank flange at its open ends.

A filling cross over pipe is to be located under main deck.

4.4.5.2 Sounding pipes:

A sounding pipe is to be provided for each of the fresh water tanks, aft peak tank, and to be terminated at accessible locations on the main deck.

A sounding pipe is to be provided for each of the oil tanks, oil overflow tank and bilge tank, and to be terminated at suitable location.

Sounding head pieces are to have brass screw caps, while those for oil tanks under the engine room which are to have self-closing gate valves of 40 mm in nominal diameter.

Sounding pipes for oil tanks are to be 65 mm in nominal diameter and those for the other tanks are to be 40 mm in nominal diameter.

All sounding pipes are to be fitted with striking plates at their lower ends.

Sounding pipes which heads are located below waterline are to have self-closing caps.

All sounding pipes should have a flange at about 300mm from the bottom for ease of repair.

4.4.5.3 Air pipes:

Air pipes are to be fitted to fresh water tanks, diesel oil tanks, oil overflow tank, dirty oil tank, bilge tank, water ballast tanks, peak tanks,, void space,. Arrangement, location and construction is to be as per rule requirement.

Each air pipe from tank is to have a bonnet type head piece at its top on exposed deck, and those for oil tanks, potable water tank and fresh water tanks are to be fitted with a removable stainless steel wire net screen.

4.4.6 Water service system:**4.4.6.1 Main equipment and tanks:**

Item	No set	Pump capacity m ³ /h	Pressure MPa	Tank capacity m ³
Fresh water transfer pump	1	60	0.45	—
Fresh water pressure tank	1	—	0.7	2.0
Fresh water pump	2	10	0.51	—
Fresh water generator	2	50m ³ /d		
Drinking water pressure tank	1	—	0.7	2.0
Drinking water pump	2	10	0.51	—
Sea water pressure tank	1	—	0.7	2.0
Sea water pump	2	10	0.51	—
Atmosphere oil boiler for service hot water	1	—	—	300000 kcal/h

Hot water circle pump	2	22.5	0.3	——
Atmosphere oil boiler for service air conditioner	1	——	——	600000kcal/h
Air conditioner hot wter circle pump	2	60	0.45	——

4.4.6.2 System description: (attach see piping diagram):

a) Fresh water system:

The vessel's fresh water system is wash water system. Cold washing is to be supplied to showers, wash basins, nozzles for washing front windows of the wheel house, and general use on main deck

The fresh water system is to be supplied by a single hydraulic system, consisting of one (1) pressure tank and two (2) fresh water pumps. The pumps are to be automatically started and stopped by the pressure of the pressure tank.

The pressure tank is to be fitted with a gauge glass, a pressure gauge, a relief valve, a drain connection and a compressed air charging connection. A quick motion relay is to be fitted for the automatic control of the pump.

Fresh water system is to include a hot water service system consisting of the hot water circulating pump and the fresh water calorifier.

b) Sanitary sea water system:

Sanitary water is to be supplied to showers, wash basins, galley, fresh water heater of hot washing water system, nozzles for washing front windows of the wheel house, water closets and general use on main deck.

The sanitary sea water system is to be supplied by a single hydraulic system, consisting of one (1) pressure tank and two (2) fresh water pumps. The pumps are to be automatically started and stopped by the pressure of the pressure tank.

The pressure tank is to be fitted with a gauge glass, a pressure gauge, a relief valve, a drain connection and a compressed air charging connection. A quick motion relay is to be fitted for the automatic control of the pump.

c) Drinking water system:

Drinking water is to be supplied to galley, fresh water heater on accommodation deck.

The sanitary sea water system is to be supplied by a single hydraulic system, consisting of one (1) pressure tank and two (2) fresh water pumps. The pumps are to be automatically started and stopped by the pressure of the pressure tank. The potable water from the pressure tank is supplied through a sterilizer to galley.

The pressure tank is to be fitted with a gauge glass, a pressure gauge, a relief valve, a drain connection and a compressed air charging connection. A quick motion relay is to be fitted for the automatic control of the pump.

d) Hot water system:

Hot water is to be supplied to showers, wash basins and sinks on accommodation deck.

The hot water system is to consist of two hot water circulating pump, a fuel oil burning hot water heater which with a temperature regulating valve, a relief valve, a thermometer, etc., and to be installed in the engine room.

The fresh water heater is to be designed to heat up water from 25°C to 85°C. Hot washing water is to be circulated continuously through circulation main line. All hot water lines to be insulated.

4.5 Miscellaneous Equipment and Outfitting:**4.5.1 Exhaust Gas system: (attach see piping diagram)**

Exhaust gas of the diesel engines is to be led to atmosphere. Exhaust gas of fuel oil burning water heater and incinerator is also to be led to atmosphere.

The exhaust gas pipe of main generator, the harbour generator, fuel oil burning water heater, incinerator will be located in funnel. The exhaust gas pipe of rudder propeller will be led to the main deck at aft ship on top of the rudder propeller room.

One set of funnel of steel plate is to be provided on the casing top of the machinery space, and the Owner's insignia is to be marked on its each side, outlined by intermittent welding bead and painted. There are to be arranged an exhaust pipe of the generator engines, silencers of generator engines, exhaust pipes of the boiler, exhaust pipe of incinerator, access ladders and doors, weather shield and other necessary fitting in the funnel. The thermal insulating of 2-layers glass cloth is to be provided for the protection of personnel from the exhaust gas pipe.

Each one silencer is to be provided for the generator diesel engines and to be constructed of steel plate and have baffling arrangement giving a silencing effect. Drain seal pipe is to be fitted on each silencer.

4.5.2 Ventilation of Engine Room: (attach see piping diagram)**4.5.2.1 Main equipment and tanks:**

Item	No set	Capacity m3/h	Pressure Pa
Engine room fans	2	54000	690

4.5.2.2 System description: (attach see piping diagram):

The air ducts are to be so arranged that the necessary air for the generator engines.

The air outlet damper is, in principle, not to be fitted for the air outlets in engine room, except that for main generator engine.

No interconnections between each ventilating fan are to be provided.

4.5.3 Overhauling of Machinery:

For overhauling of the main generator engine, there is to be a portable electric hoist on the overhead lifting beam fitted over each main engine.

I - beams are to be securely supported from the ship's structure above main generator engines and generators. All controls and operations are to be done from the main engine top level.

For harbour diesel generator set to be provided with chain block and eyes for overhauling and maintenance.

The generator diesel engines are to be have adequately designed lifting arrangement to facilitate overhaul and normal maintenance using chain blocks included in the general tools.

Other major pumps and heat exchangers and sea suction strainers are to have eye plates to facilitate overhaul and normal maintenance. Sufficient Lifting eyes are to be provided where necessary for other equipment.

4.5.4 Ladder, Handrails, Gratings and Floor Plates:

The ladders, handrails, gratings and floor plates are to be provided in accordance with the Builder's standard practice.

Main access ladders are to be led fore and aft wherever possible and are to slope not in excess of 60deg. from the level with 600 mm width and that for sub-ladder is of 400 mm. Access ladders are to have steel flat stringers and non-slip treads.

Ladders are to be inclined type except where is unavoidable to use a vertical ladder.

Handrails throughout the machinery space including dangerous area are to be of steel pipe and are to be supported by stanchions of steel pipe.

In general, the flooring is to be checkered steel plate of minimum 5 mm in thickness or heavy duty gratings galvanised and the rests are to be fastened to suitable bars of angle frame.

Portable plates are to be provided where necessary for access to valves, strainers, manifolds, and to spaces below floors.

Floor plates are to be bolted in way of equipment, which requires periodical inspection.

Open gratings are to be installed where necessary for space ventilation as well as for inspection, for example in funnel etc., in accordance with the Builder's standard practice.

4.5.5 Sea Chests and Strainer:

Suction sea chests are to be of hinge type heavy welded steel plate construction and welded on ship's structure. Each sea chest is to be provided with a removable galvanized steel grid.

The area of suction sea chest is to be abt. 2.0 times of the area of sea suction pipes as per rule requirement.

Studs and nuts are to be of stainless steel.

A compressed air connection is to be fitted for weed blow-off.

Overboard connections fitted to the hull are to be provided with distance piece of steel pipe fabricated from steel plate and welded to the shell.

A sea water strainer on sea water lines is to be of fabricated steel body (coated with tar epoxy) with a strainer element of a galvanized steel plate.

Suction sea chests and overboard connections are to be arranged as minimum as possible and practicable.

The efficient deaeration is to be considered for sea chests, such as vent holes to the shell and/or standing air pipe upto upper deck level according to the construction of sea chest as adopted.

The vertical sea suction pipe is to be extended to at least 250 mm into the main sea chests.

4.5.6 Workshop Area Machinery:

Item	Set	Type	Capacity	Remark
Hoisting device	3		1T	
Lathe	1			
Drilling and milling machine	1			
Work bench with drill	1	Elect. Driven	Drill diameter : approx. 20 mm	
Vice and Pedestal Grinder	1	Double head, elect. Motor driven (dry type)	Stone diameter : abt. 200 mm	
fuel valve testing unit	1			Manufacture supply

4.5.7 Spare Parts and Tools:

The spares and tools are to be in accordance with the manufacturer's standard practice.

4.5.8 Painting in Engine Room:

Painting in the engine room including the primer for tanks, air trunks etc., is to be applied according to Builder's standard and finished color to owner's choice.

Finishing color conditioning of the machinery and equipment is to be applied in accordance maker's standard and subject to Owner's approval.

The color plan is to be submitted for the Owner's review and approval.

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

Piping system	Colour
---------------	--------

Fresh water	Blue
Sea water	Green
Fuel oil	Red
Lub. Oil	Yellow
Steam	Silver
Compressed air	Grey
Bilge	Black

4.6 Air Conditioning, Heating & Ventilation System:

4.6.1 Air conditioning system:

The air conditioning system is to be of non-CFC refrigerant directly evaporated type to supply cooling air for all air conditioning rooms and to be dimensioned to meet the following design conditions in summer.

Item		Summer	Winter
Outside	Temp	40°C	-15°C
	RH	90%	-
Inside	Temp	27°C	20°C
	RH	50%	50%

Fresh air volume rate about 30%

sea water temperature: 32°C

Cooling medium: R404A

Electric source: AC380V, 50Hz, 3ph

4.6.1.1 Air conditioning plant:

a) Compressor unit:

There have one (1) set marine water chiller which located in the air conditioner room for supply secondary cooling water to the main indirect air conditioner.

The compressor unit consist of compressor, condenser, dry evaporator, drier, filter, temperature controller, thermal expansion valve, solenoid valve, electric control box and etc.

Model		Performance Index
Item		MCW-750
Cooling cap.	kW	750
Refrigerant		R404A

Compressor power	kW	2x112
Cooling water flow	m3/h	2x 120
Cooling water temperature		32°C(sea water)
Secondary cooling water flow	m3/h	160
Secondary cooling water inlet & outlet temp.		12/7°C(fresh water)
Power supply	Main circuit	AC380V 3Φ 50Hz
	Control circuit	AC220V 1Φ 50Hz

The capacity of A/C plant to be decided to maintain the A/C room's conditions (except the galley) mentioned above when the doors, windows and side scuttles are closed. The volume of fresh air from outside is to be more than about 30% of total A/C supply air.

b) Indirect air conditioner:

There have six (6) sets package air conditioner for crew deck. Each deck has one set (1) independent air conditioner. The package air conditioner consist of fan, cooler, hot water heater, humidifier, three way valve, temperature controller, air filter, control box and etc.

Model Item		Performance Index				
		MAU(W)-220	MAU(W)-90	MAU(W)-120	MAU(W)-180	MAU(W)-50
Cooling cap.	kW	220	90	120	180	50
Heating capacity	kW	230	95	130	200	55
Refrigerant		frozen water (inlet/outlet 12°C/ 17°C)				
Frozen water flow	m3/h	38	16	20	32	9
Heating media		hot water (inlet/outlet 85°C/ 65°C)				
Air flow	m3/h	15000	7000	9800	12000	3200
Air ratio		40%				100%
Excess pressure	Pa	900	800	850	900	700
Fan power	kW	11	7.5	11	11	3
Humidifier water consumption	kg/h	85	30	40	60	18
Power supply	Main circuit	AC380V 3Φ 50Hz				
	Control circuit	AC220V 1Φ 50Hz				

APPLICATION	Bridge deck & C deck	B deck / A deck	F'cle deck	Main deck	Main deck
Qty.	1set	2sets	1set	1set	1set

4.6.1.2 Air conditioning ducting system

The A/C space shall include all crew living rooms, public rooms, wheel house and crew space but except toilet etc.

Each one (1) set marine type air-cooled packaged air conditioner should be able to keep a suitable work and living environment.

The A/C ducting to be of rectangular type or pre-installed round spiral ducts with fittings, dampers, reducers, branches, elbows, penetrations and etc. The air diffusers of ceiling type to be fixed in the terminal of ducting system to distribute A/C supply air into A/C space.

4.6.1.3 Cooling water system:

a) Main equipment:

Item	No set	Capacity m3/h	Head m
Sea water cooling pump for air conditioner	3	120	34

b) System description: (attach see piping diagram)

There have three (3) sets sea water cooling pump for compressor cooling. Two of them are normal use and the other one is standby.

The pumps have draught sea water from main sea water line and discharge to the outboard through condenser which built in compressor unit.

4.6.1.4 Frozen water system:

a) Main equipment:

Item	No set	Capacity m3/h	Head m
Frozen water pump	2	160	44

b) System description: (attach see piping diagram)

There have two (2) sets frozen water pump for air conditioner cooling source. One is normal use and the other is standby.

The pump will circle the frozen water from compressor unit to package air conditioner cooler which located on each deck.

4.6.1.4 Hot water system:

a) Main equipment:

Item	No set	Capacity m3/h	Head m	Capacity Kcal/h
Hot water pump	2	60	45	
Hot water boiler				600000

b) System description: (attach see piping diagram)

There have two (2) sets hot water pump for air conditioner cooling source. One is normal use and the other is standby.

The pump will circle the frozen water from hot water boiler to package air conditioner hot water exchanger which located on each deck.

4.6.2 Ventilation:

The mechanical or natural supply and/or exhaust ventilation to be provided in the galley, winch room, CO2 room and toilet etc.

The space for main deck should to be mechanical exhausted air and natural supplied air with non sparking fan driven by explosion proof motor.

The requirement of air change times for ventilating spaces to be satisfied in accordance with the requests in relative regulation and as follows.

Accommodation	Supply Natural	Supply Mechanical	Exhaust Natural	Exhaust Mechanical	Remarks
Package toilet				~15	AC return air supply
Sanitary space				20~25	AC return air supply
Bathroom				15~20	AC return air supply
Laundry				15~20	AC air supply
Battery room	X			~30	dIIC-T1
Battery charge room	X			15~20	
Hospital room		6~10			AC air supply outlet \geq inlet
Sick room		6~10		12~15	AC air supply outlet \geq inlet
Dressing room				~8	AC air supply
Linen store					AC air supply
Bridge		~15			AC air supply

Conf. room		~12			AC air supply
Mess room		~12		/	AC air supply
Galley		~35		~50	AC air supply
Package air condition room	X			6~12	AC return air supply
Air conditioner room	X	~30		~30	
Gymnasium		8~10		~4	AC air supply
Commissariat room		8~12		~12	
Winch room	X			6~8	
Painting room	X			~15	dIIB-T3
O ₂ / room	X			~15	dIIC-T2
C ₂ H ₂ room	X			~15	dIIC-T2
CO ₂ room	X			6~15	
Rudder propeller room	X			6~30	
Emergency generator room	X	6		~30	
Workshop		~15	X		
Engine room		X		X	Base calculation
Engine watch room		6~12	X		

Note: x=natural ventilation without determined quantity of air change

4.6.3 Refrigerating provisions storage:

The refrigerating provisions are to be stored in five (5) rooms which located on main deck as described as followings:

room name	volume (m ³)	room temperature (°C)
Dairy food room	38.76	+2
Fish room	45.74	-18
Semi-product room	18.2	-4
Vegetable room	91.24	+4
Meat room	65.42	-18

There have two (2) sets of combined refrigerator plant which located in the air conditioner room. The plant consist of compressor, condenser, pressure controller, temperature controller, sight glass, drier, filter, oil separator, steam/liquid separator, control box and etc

Model Item		Performance index	
		MPR-10	MPR-14
Cooling cap.	kW	11.6	15.5
Compressor power	kW	6.5X2	8.7X2
Refrigerant		R404A	R404A
Cooling water flow	m ³ /h	10x2	14x2
Cooling sea water temp.		32°C	32°C
Power supply	Main circuit	AC380V 3Φ 50Hz	
	Control circuit	AC220V 1Φ 50Hz	
Application		Fish room, semi product room	Vegetable room, meat room
Qty.	Set	1	1

Part V: ELECTRIC

5.1 General

It is the intent of this Part to confirm the electric equipment to be installed and the work to be executed for the construction of the Vessel.

The electric equipment and installation shall comply with the Rules and Regulations specified in this Specification and Builder's standard.

The electrical installation including machinery, fittings, switchgear, wiring etc. shall comply with the specifications and Rule and Regulations mentioned in the part 1.1.4 of the specification and IEC publication.

The wiring shall be of 3 wire insulated system for A.C. three phase circuit, and of 2 wires insulated system for A.C. single phase circuit and D.C. circuit.

Ambient temperature of 45°C shall be assumed for electrical equipment in all spaces. Where ambient temperature is in excess of these values, the temperature specified by the Rule shall not be exceeded.

Current rating of cables shall be decided on the basis of ambient temperature of 45°C throughout the Vessel.

The arrangement of the electric equipment throughout the Vessel shall be such as to provide ready and safety access to parts for inspection, maintenance and repair as far as practicable.

Electric equipment shall be so located that as far as practicable they are not exposed to risk of mechanical injury or damage from water, steam, oil or excessive heat. Where necessarily exposed to such risks, the equipment shall be suitably constructed, enclosed or

protected as follows except those specially indicated in the Specification.

- Drip-proof type (IP 20) Inside control room and accommodation
- Drip-proof type (IP 22) Inside engine room (above floor), steering gear room and other enclosed machinery space
- Splash-proof type (IP34) Inside engine room (below floor), purifier room, galley and laundry.
- Water-proof type (IP 56) Weather exposed space

5.1.1 Applicable Voltage and Phase for Equipment

1) Standard Voltage, Number of Phase and Frequency

-Normal supply system

- A.C. 400V, 3 Ph, 50 Hz system
- A.C. 220V, 3Ph or 1 Ph, 50 Hz system

-Emergency supply system

- A.C. 400V, 3 Ph, 50 Hz system
- A.C. 220V, 3Ph or 1 Ph, 50 Hz system

-D.C. 24V supply system

2) Applied Voltage and Number of Phase for Equipment

Purpose		Voltage (V)	Phase (Ph)
Motor		A.C. 400	3
		A.C. 220	3 or 1
Electric welder		A.C. 400	3 or 1
Electric range and oven		A.C. 400 A.C. 220	3 3 or 1
Small appliance		A.C. 400 A.C. 220	3 or 1 3 or 1
Lighting	Up to distribution board	A.C. 220	3
	Final circuit	A.C. 220	1
Interior communication, nautical, alarm/monitoring system		A.C. 400 A.C. 220 D.C. 24	3 or 1 3 or 1
Radio equipment		A.C. 220 D.C. 24	3 or 1

5.1.2 Name Plate

Language shall be in English and Chinese.

Type of plate shall be as follows:

- Rotating machine: Non-corrosive metal plate
- Controller and panel: Plastic plate except non-corrosive metal

- Others: Plate for those exposed to weather maker's standard

5.1.3 Equipment and Material

Electrical equipment and material shall be marine use one in general.

Fuse, terminal and lamp shall be as mentioned below, except those for special equipment such as navigation instrument, radio equipment and other electronic equipment shall be of maker's standard.

Fuse In general, tubular or screw type fuse to be used except special type fuses for electronic equipment.

Terminal Solderless type except small electric terminal for lighting fixtures, switch and branch box etc.

Lamp

	Purpose	Base
For fluorescent lamp	General light	Two pin type
For incandescent lamp	General light	E-27 (≤ 100 W)
	Pilot lamp of switchboard, starter, console, etc.	Manufacturer's standard
For sodium and halogen lamp	Flood light and searchlight	E-40

5.1.4 Electric Cable and Installation

1) General

All cables to be approved by the classification society.

Electric cable in general to be marine cable and flame retardant type tested according to IEC332-3A.

Flame resistance type cable tested according to IEC331 to be used for requirement of Rule.

ALL cables tested according to requirement of Rule. 0.6/1kV rated voltage of cables to be use for rated voltage 400V consumer. 250V rated voltage of cables to be use for rated voltage 220V consumer.

2) Cable Application

For power system and lighting system, Cables to be of XLPE insulated polyolefin inner sheathed galvanized steel wire braided polyolefin outer sheathed low-smoke halogen-free flame retardant shipboard power cable, type SC (CJPF96/SC or CJPF96/NC (fire-resisting))

For navigation & radio system, Cables to be of XLPE insulated polyolefin inner sheathed tinned copper wire braided polyolefin outer sheathed low-smoke halogen-free flame retardant shipboard power cable, type SC (CJPF86/SC or CJPF86/NC (fire-resisting))

For communications system, Cables to be of XLPE insulated polyolefin inner sheathed tinned copper wire braided polyolefin outer sheathed low-smoke halogen-free flame retardant shipboard symmetrical communication cable, type SC (CHJPF86/SC or CHJPF86/NC (fire-resisting)).

For portable appliances such as portable hand lamps and portable cargo lamps, cables to be of EPR insulated cross-linked PO sheathed flame retardant halogen-free low-smoke shipboard power flexible cable, type SC (CEPJR/SC) .

A state of emergency equipment needed to continue working with CJPF96NC or CJFP86NC-type cable. For instance emergency lighting system、 emergency shutdown system、 fire alarm system、 general alarm system、 public address system etc.

Frequency conversion cables are to be used for frequency equipment.

3) Cable Installation

Cables or wire runs are to be straight and accessible for inspection and repair as far as possible.

Cable runs shall be carefully selected in order to minimize the adverse effects of heat and moisture, for example they shall be kept away from steam pipes, exhaust uptakes, bilge, etc.

Where the cables are exposed to any mechanical damage, they are to be protected by steel plate, steel conduit or flexible tube.

Cables installed under the lowest floor in engine room to be protected by galvanized tube or flexible tube.

Avoiding to run cables on open deck as much as possible. The cable through the expose deck the goose-neck pipe need using, and expose deck and engine space cable connections the heat-shrink rubber sleeve must be using. The sleeve pipe should be using goose-neck pipe through the deck when the goose-neck pipe through the deck. The cable clamp bundle tape on the expose deck and in the machinery space should be stainless steel.

All cables pass through watertight decks or watertight bulkheads to be provided with watertight glands, deck tubes, or equivalent means such as multi-cable transit and the cables passing through other decks to be provided with deck tubes or coamings.

Signal and control cables shall be lead separately (in different bundles) from power cable.

Frequency conversion cables shall be lead separately (in different bundles) from normal cable.

Cables are not to be installed close to steam lines and diesel engines exhaust pipes.

5.2 Electric Sources

5.2.1 General

The electric power generating plants shall consist of the following generators:

- Three (3) sets of main diesel generator (M/G)
- Two (2) set of harbor generator (H/G)
- One (1) set of emergency generator (E/G)

The number and rating of ship's service generator sets shall be sufficient to insure the operation of services indispensable for the propulsion and safety of the vessel and crew and minimum comfortable conditions of habitability.

The capacity of emergency generator shall be sufficient to supply the emergency power according to the requirements of the Rule.

The generators shall serve under various conditions as 《Power Loads Estimaing Table》 .

5.2.2 Main Diesel Generator

Main diesel generators to be installed in engine room as follows:

1) Particulars

Type	Synchronous
Enclosure	Drip- proof IP23
Cooling system	water
Output	abt.1000 kW
Voltage	A.C. 400 V
Frequency	50 Hz
Phase	3 phase
Power factor	0.8 (lagging)
Revolution	≤900 r/min
Rating	Continuous at full load
Exciting system	Brushless rotary exciter
Insulation	Class F
No. of Bearing	manufacture's standard
No. of set	3
Ambient temperature	45 °C

2) Construction

Bearing, lubricating system and thermometer to accord to maker's standard.

3) Space Heater

Space heater is to be installed in the frame of each generator to prevent the condensation of moisture when the generator is idle, and fed from 220 volts A.C. and interlocked with generator air circuit breaker.

4) Self Exciting Equipment

The exciting equipment to be of brushless rotating silicon rectifier type and provided with current forcing transformers for short circuit current and voltage transient excitation. The manual voltage regulator is to be built in M.S.B.

5) Governor Motor

The governor motor is to be electrically operated and controlled from the main switchboard.

6) Electric Temperature Detector

Each generator to be provided with two (2) temperature detectors in each phase of stator coils for measuring the temperature of stator coil and temperature to be indicated .

7) Power Manage System

One (1) set of power manage system is to be provided and assembled in main switchboard.

The system have the function of automatic startup、 automatic synchronizing 、 automatic sharing effective power loads、 automatic uninstal loads and automatic separation between three main generators.

5.2.3 Harbor Generator

Two 250kw harbor diesel generators are to be installed in engine room, they can run long-term in parallel. They should be run short-term with main generators in parallel and shift load. The harbor generators can't startup automatic.

Parallel mode is hand mode/ half automatism mode.

5.2.4 Emergency Generator

1) General

The emergency generator is to be installed in the emergency generator room.

The emergency generator is not to be capable of running in parallel with the harbor diesel generator and not to be capable of feeding main switchboard with its source.

The emergency generator is to be operated locally and manually and to be automatically started at no - voltage of emergency switchboard.

2) Particulars

No. of set	One (1)
Enclosure	Drip-proof IP23
Ventilation	Self ventilated with air filter
Excitation	Brushless rotary exciter type
Output	250 KVA (200 kW)
Voltage	A.C. 400 V
Phase	3 phase
Frequency	50 Hz
Revolution	1800 rpm (4 poles)
Power factor	0.8 (lag)
Insulation class	B or F for rotor and stator (depending on maker's standard)
Rating	Continuous at full load
Bearing	Manufacturer's standard
Space heater	Sheath wire type without thermostat
Ambient temperature	45°C

3) Exciting Device

Exciting device of generator is to be rotary exciter of brushless type and to be connected to the generator shaft end directly.

The automatic voltage regulator (AVR) with voltage adjuster is to be provided.

4) Automatic Start of Emergency Generator

The emergency generator is to be started automatically by detecting no voltage of the emergency switchboard bus bar .

5.2.5 Transformers

The transformers are to be installed as follows:

Each transformer is to be of 50 Hz, dry type, air cool by natural circulation, drip-proof and to have class B insulation.

		NO.	No. Capacity (KVA)	Voltage Prime/Second.	Location
(1)	For general service	2	300	400/230 3PH	Near the main Switchboard (outside control room)
(2)	For emergency service	2	63	400/230 3PH	Emergency generator room
(3)	For galley devices	1	300	400/400 3PH	Under main deck
(4)	For galley devices	1	50	400/230 3PH	Under main deck

5.2.6 Storage Batteries

The maintenance free lead-acid type batteries to be installed as follows:

	No. of set	Capacity (Ah)	Voltage (V)	Location
For general service	2	600/400	24	Battery room
For radio equipment	Manufacturer's standard			Battery room

5.3 Power Distribution System

5.3.1 General

In general, power for large and/or essential motors, group control panel to be supplied from main switchboard or emergency switchboard directly and other small power consuming devices to be supplied through distribution boards from the main switchboard.

For 220 volts lighting and heating system, the power is to be supplied from transformers and circuits from main switchboard to distribution boards to be three-phase three-wire system, and from distribution boards to lighting fittings or heating equipment to be single-phase two wire system.

For 24 volts interior communication and alarm system, the power is to be supplied from the battery and feeder circuit is two-wire system.

5.3.2 Switchboard

1) Construction and installation

The switchboard is to be of dead back and self standing type and to be made of steel frame work.

The bus bar of main switchboard shall be divided in two (2) parts with circuit breaker in between.

The switchboard is to be provided with handrails in front of the switchboard.

2) Meter

All meters mounted on the front panel of the switchboard to be of the semi-flush and 100mm (or maker's standard) rectangular type with circular scale. The accuracy of meter is to be within 1.5 percent of full scale deflection.

3) Generator Air Circuit Breaker

The circuit breakers for main generators to be motor or magnetically operated trip free air circuit breakers having long time over current trip, instantaneous trip, short time delay trip, under voltage trip features.

Each air circuit breaker is to be provided with interrupting capacity against short circuit current.

Generator ACB is to be interlocked with shore supply connection.

In addition to ACB, the isolated link to be provided on each generator circuit.

The circuit breaker for emergency generator is to be of MCCB.

4) Feeder Circuit Breaker

Molded case circuit breakers with inverse time thermal trip and instantaneous magnetic trip features are to be provided for 400 volts and 220 volts out going circuits.

Molded case circuit breakers are to be of fixed type.

5.3.3 Main Switchboard

The main switchboard is to be installed in the engine control room and consist of following panels.

No.1 Group starter panel

No. 1 400 volt feeder panel

No. 1 Harbor generator panel

No. 1 Main diesel generator and bus tie panel

No. 2 Main diesel generator and Synchronizing panel

No. 3 Main diesel generator panel

No. 2 Harbor generator panel

Crane and winch panel

No.2 400 volt feeder panel

No.2 Group starter panel

220 volt feeder panel

The following instruments are to be installed on the switchboard:

1) Generator Panel

On each generator panel:

- 1 - ACB
- 1 - ACB close indicating lamp
- 1 - ACB open indicating lamp
- 1 - Generator running lamp
- 1 - Generator space heater switch
- 1 - Generator space heater close indicating lamp
- 1 - Manual voltage adjuster
- 1 - A.C. voltmeter and selector switch
- 1 - A.C. ammeter and selector switch
- 1 - Frequency meter and selector switch
- 1 - Indicating wattmeter

One set of synchronizing equipment shall be installed in NO.2 main generator panel only.

2) Group Start Panel

Necessary quantity molded case circuit breakers and magnetic force start for all feeder circuits as required.

3) 400 Volt Feeder Panels:

Necessary quantity molded case circuit breakers for all feeder circuits as required.

- 1 set - Insulation detection device
- 1 - Pilot lamp for shore connection

4) 220 Volt Feeder Panel

Necessary quantity molded case circuit breakers for all feeder circuit as required.

- 1 - A.C. voltmeter and selector switch
- 1 - A.C. ammeter and selector switch
- 1 set - Insulation detection device

5.3.4 Emergency Switchboard

One (1) emergency switchboard is to be installed in the emergency generator room. The emergency switchboard to be energized from the M.S.B. while diesel generator is in normal operation and once the emergency switchboard bus bar becomes no-voltage, the emergency switchboard is to recover electric source by the emergency generator.

In general, description and construction are to be the same as the main switchboard, except that fluorescent lamp for panel front illumination to be fitted on the emergency switchboard and the panel is designed for wall standing, maintenances can be done from front of the panel.

5.3.5 Shore Connection Equipment

One (1) set of 400 volts, 50 Hz, three phase, 400 amperes, water-tight type shore connection box with a molded case circuit breaker and phase sequence indicating lamps to be installed on main deck and permanently connected to main switchboard.

5.3.6 Distribution Panels

Every distribution panel should be protected by steel case. The front door to have an efficient latch of substantial type.

Distribution panel to have necessary components as follows:

- 1) 400 volts circuits are to be equipped with 3-pole miniature circuit breakers (MCB) with over current tripping devices.
- 2) 220 volts circuits are to be equipped with 2-pole or 3- pole miniature circuit breakers (MCB) with over current tripping devices in general.
- 3) 24 volts circuits are to be equipped with 2-pole miniature circuit breakers (MCB) with over current tripping devices. Temporary emergency lighting circuits are to be equipped with fuses.
- 4) Two spare breaker to be provided in each distribution panel.

5.3.7 Charging and Discharging Panel

Two (2) set of charging and discharging panels for general service battery are to be of parallel floating charging type. They are to be installed in C deck charging and discharging room and main deck charging and discharging room

All necessary charging apparatus i.e. source switch, transformer, voltage adjuster, silicon rectifier, voltmeter, ammeter, indicating lamps, moulded case circuit breaker, fuses, etc., to be provided.

One (1) set of battery charging panel for radio equipment of maker's standard type to be located in radio station.

5.3.8 Testing Panel

One (1) set of testing panel is to be fitted in engine room. Various sorts of lamp holder, receptacle, and fluorescent lamp holder with different power and output power supply connector base with different voltage grade are set.

Electric source of testing panel to be fed as follows:

- 400 volts A.C. 3 phase, 50 Hz 10A
- 220 volts A.C. 3 phase, 50 Hz 10A
- 24 volts D.C. -- -- 3A

5.4 Electric Motors and Controls

5.4.1 General

The motors, in general, to be designed of squirrel cage induction type and to operate on 400 volts, 3- phase, 50 Hz, A.C., and the motors less than 0.5 KW and domestic service motors to be designed to operated on 400 volts or 220 volts single or three phase A.C. in accordance with maker's standard.

The domestic service motors and special motors such as galley commissary equipments, laundry machines workshop machines, governor motors etc. to be as per maker's standard, regarding insulation and construction of enclosure etc.

Motors and controllers supplied as complete set for auxiliary machine such as deck machine, air conditioning unit, ventilating fans, etc. to be constructed in accordance with the maker's standard.

5.4.2 Motors

1) Insulation

The motors to have class "B" or "F" insulation.

2) Enclosure

According to requirement of Rule.

3) Bearing

According to maker's standard.

4) Speed Changing

All motors to be of single speed.

5) Space Heater

Space heater is to be installed in the frame of each above 7.5kw motor to prevent the condensation of moisture when the generator is idle, and fed from 220 volts A.C. and interlocked with motor breaker.

5.4.3 Controls

In General, the starters for vital motors are located at main switchboard.

Magnetic starters are used for motors more than 0.75 kW. The starts for all motors are to be of magnetic direct-on-line startup type except those for above 75 kW motors to be of the star-delta startup type.

Remote local start and stop push button with running indication lamp is to be located near motors except for fan motors.

5.4.4 Special Control Provision

1) Emergency Stop Switch

Emergency stop push button for forced draft fan, engine room fan, oil pumps. is to be located near engine room entrance and in wheelhouse console.

Emergency stop push button for accommodation fans and air condition is to be located in each deck and wheelhouse console.

Emergency stop push button should be fitted with plastic covers.

2) Preference Trip

Non-essential loads shall be interrupted automatically in case of over current of anyone of the generator to prevent from the vessel's power failure.

5.5 Crane System

One 900t-type crane is installed on stern of the vessel. The power is from main switchboard. The control mode adopts transducer control.

5.6 Winch System

Eight 160kw orientation winches are fitted on four winch tanks average. The control mode adopts transducer control. Transducers are to be installed on transducer room. Local control box is installed near each winch, central controller is fitted in wheelhouse.

5.7 Lighting System

5.7.1 General

In general, unless otherwise noted, lighting fixtures and accessories to be as follows:

Non-water-proof type (IP22)	Accommodation spaces
Splash-proof type (IP34)	Store, galley, lavatories, bath room,
Water-proof type (IP56)	The open air spaces, Explosion-proof type Battery room, paint store and C2H2 room, engine room, propeller room, air condition room, refrigeration& air machine room etc.

5.7.2 Lighting Distribution Box and Unit

(1) Normal lighting distribution boxes and units:

About twelve normal lighting distribution boxes and two distribution units are fitted in the vessel.

One normal lighting distribution box is installed in each winch tank entrance, providing illumination for winch tank.

One normal lighting distribution box is installed in deck machine office, providing illumination for propeller tank and crane area.

One normal lighting distribution box is installed in deck machine office, providing illumination for stern deck area.

One normal lighting distribution box is installed in engine control room, providing illumination for engine room and eng. shop.

One normal lighting distribution box is installed in each cable room, providing illumination for every deck cabin.

One normal lighting distribution unit is installed in wheelhouse control console, providing illumination for wheelhouse and outside passage.

One normal lighting distribution unit is installed in wheelhouse control console, providing illumination for each deck flood lights..

(2) Emergency lighting distribution box and unit:

About five emergency lighting distribution boxes and one distribution unit are fitted in all vessel.

One emergency lighting distribution box is installed in charge & dis. room, providing emergency illumination for stern winch tank、propeller tank、crane area and stern deck cabin.

One emergency lighting distribution box is installed in inner passage of main deck, providing emergency illumination for engine room、eng .shop and bow winch tank.

One emergency lighting distribution box is installed in mess room, providing emergency illumination for main deck and forecastle deck cabin.

One emergency lighting distribution box is installed in electric office, providing emergency illumination for cabins of A deck and B deck.

One emergency lighting distribution box is installed in project team office, providing emergency illumination for C deck cabins and wheelhouse.

One emergency lighting distribution unit is to installed in wheelhouse control console, providing emergency illumination for outside passage.

5.7.3 Lighting Fixture

In the vessel, the lighting fixtures are installed as follows:

- 1) 2x20W Fluorescent pendant light (with guard) is to be fitted in engine room.
- 2) 2x20W Fluorescent pendant light (IP56) is to be fitted in machine location, such as propeller tank、store、eng. shop、emergency generator room、CO2 room、air condition room、refrigeration.& air condition room etc.
- 3) 2x40W Fluorescent pendant light (IP56) is to be fitted in winch tank.
- 4) 2x20W Fluorescent ceiling light (IP22) is to be fitted in fitment room., such as sailor room、conference room、office、mess room、gymnasium、stairs room etc.
- 5) 1x20W Fluorescent ceiling light (IP22) is to be fitted in inner passage.
- 6) Incandescent pendant light (IP56) is to be fitted in outside passageways.
- 7) 2x20W Fluorescent ceiling light (IP44) is to be fitted in galley、bath room and toilet etc.
- 8) 40W reading lamp is installed on each desk in cabin.
- 9) 8W fluorescent bedside light is installed on side of each bed.
- 10) 8W fluorescent type mirror light over the mirror of each wash basin.
- 11) Suitable number of 400W reflector type halogen flood light for illumination of the main engine cylinder head in engine room.
- 12) Explosion-proof fixtures must be installed in battery room、paint store、O2 room and C2H2 room.

13) The searchlight & flood lights to be installed as follows:

2000 watts searchlight (total 2)	Two (2) on compass deck
800 watts sodium or halogen flood light (total 4)	Two (2) on wheelhouse deck Two (2) on A deck
400 watts halogen flood light (total 18)	Three (3) on forecastle deck Two (2) on fore of crane Two (2) on fore Four (4) on main crane area Seven (7) on stern

The above lights to be controlled from wheelhouse and deck machine office.

- 14) Two (2) 400 watts halogen flood light accommodation ladder on the main deck and

controlled from wheelhouse.

15) One (1) 400 watts incandescent-type light provide lighting for each vessel's name board and be controlled from wheelhouse control console.

16) Rescue boat lights and life raft lights are provided as follows:

Two (2) 400 watts halogen flood light (total 2, emergency power) are installed near the rescue boat.

Two (2) 100 watts low-volt searchlight (total 2, D.C. 24V) are installed near life raft.

17) One (1) 40 watts incandescent type chart lamp (with dimmer switch) for chart table.

18) A red pilot lamp which indicates (ON) or (OFF) of the light in refrigerating provision chamber to be installed in inner passageway near the chamber.

5.7.4 Emergency Lamps

Emergency lights are fed from emergency switchboard and used for emergency lights in case of trouble of diesel generators. to be of some of general light in the following room and spaces:

Wheelhouse、conference room 、office、toilet、bath room 、cable room、inner and outside passageway、 stairs room、 life raft area 、 gymnasium、 galley、 mess room、 sickbay、 CO2 room、 emergency generator room、 refrigeration machine room、 air-conditioning room、 engine room、 propeller tank、 winch tank and other working spaces and so on.

A number of temporary emergency lights are supplied in above cabins of the vessel, power supply is from the battery. In the crew rooms, the bedside lamp ,as emergency lighting power, is to be fitted beside each bed, no temporary emergency.

5.7.5 Navigation Lights and Signal Lights

A complete set of electric navigation lights and signal lights required by the Rules and Regulation to be installed as follows:

1) Navigation Light

2 - Masthead light (2 - 60 watts lamp bulbs)

1 - Starboard light (2 - 60 watts lamp bulbs)

1 - Port light (2 - 60 watts lamp bulbs)

1 - Stern light (2 - 60 watts lamp bulbs)

The navigation light indicator-panel (graphic panel) in wheelhouse to be supplied through three (3) separate feeder circuits, one is to be fed directly from main switchboard, one from emergency switchboard, last one is to be fed from charging & discharging panel.

2) Signal Light

2 -2 x 60 watts anchor lights (fixed type) to be fed through navigation light indicator panel

2 - 2 x 60 watts not under command lights on radar mast (fixed type) to be fed through navigation light indicator panel.

4 -60 watts red signal light (fixed type)

4 -60 watts green signal light (fixed type)

2 -60 watts white signal light (fixed type)

Above signal lights to be fed from 220 volts A.C. except otherwise noted, and to be controlled from wheelhouse control console.

One (1) Morse light on radar mast, this light to be commonly used as air horn signal light and to be controlled by the controller and two keys.

One (1) portable daylight signal light (ALDIS type) with three (3) receptacles (DC 24V) fed from battery with charger.

5.7.6 Helicopter Deck Perimeter Lamp System

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

5.8 Electric Navigation Equipment

5.8.1 Magnetic Compass

One (1) set of standard compass shall be installed on the compass deck.

The illumination lamp shall be provided and supplied from A.C.220V and D.C. 24V supply systems.

One (1) compass repeater shall be installed on the wheelhouse console.

5.8.2 Propeller Control

The vessel has two sets of all turn rudder propeller system, host remote control device by the rudder propeller supplier supporting, remote control device with the rudder propeller angle of instructions、main engine of propeller telegraph and tachometer devices

5.8.3 Echo Sounder

One (1) set of echo depth sounder to be installed as follows:

1 –Main display unit	Chart space
1 –Repeater	Wheelhouse console
1 – transition switch	Chart space
2 - Transducer	Bottom of Vessel

The oscillation frequency is to be of 200 kHz.

Sounding range is 0 - 400 m.

The scale unit is to be of metric system.

To be fed from 220 volts A.C.

5.8.4 Radar

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

	No.1 radar	No.2 radar
Frequency	X-band	X-band

Transceiver output	12kW	12kW
Effective display diameter	340mm	340mm
Display	23"	23"

5.8.5 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

5.8.6 Weather Facsimile

One (1) set of weather facsimile (8") with paper (4 rolls) shall be provided in chart space.
To be fed from 220 volts A.C.

5.8.7 VDR

One (1) set of VDR equipment is to be installed.

The VDR to meet the performance requirements of the IMO resolutions and testing standards of the International Electronics Commission (IEC)

5.8.8 AIS Equipment

An Automatic Identification System (AIS) according to the IMO resolutions to be installed.

5.8.9 GPS & DGPS Navigator

1) One (1) GPS navigator shall be provided:

1 –GPS antenna

1 –GPS Display Unit

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

2) One (1) DGPS navigator shall be provided:

1 –DGPS antenna

1 –DGPS Display Unit

1 –Signal Distribution Unit

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

DGPS signal shall be connected to the INMARSAT-C、MF/HF DSC、 VHF DSC、Radars、AIS、 VDR、 Master-Slave clock and ES.

5.8.10 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.

5.8.11 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.

5.8.12 Control Stand

Wheelhouse console、winch console are installed in wheelhouse.

5.9 Communication Equipment and Alarm System

5.9.1 Telephone Equipment

1) Automatic Telephone System

One (1) set of about 150 circuits automatic telephone system to be located in the vessel.

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

Telephones in engine room is to be of anti-noise type

2) Sound Power Telephone

Sound Power telephone to be located as follows:

Wheelhouse

Engine room

Engine control room

Propeller tank

CO2 room

Emergency generator room

Freq. changer tank

5.9.2 Public Address

One (1) set of public address with 2x200 Watts amplifier to be as per Rules and Regulations

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

5.9.3 General Alarm

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.

5.9.4 Monitor Alarm System

One (1) set of monitor alarm system with extension alarm function, consist of motor, pressure, temperature, level alarm, is to be installed in engine control room and fed from 220 volts A.C.

5.9.5 Fire Detection and Alarm System

One (1) set of fire detection and alarm system to be installed as follows:

Fire alarm control and indication equipment:	Wheelhouse
Fire alarm repeater:	Engine control room
Heat detector:	Galley
Heat detector of explosion-proof:	Battery room、 paint store、 O2 room、 C2H2 room
Smoke detector:	Passage, stair, engine room, propeller tank, machinery space, crew room、 conference room、 mess room etc.
Push button:	Passage near the exit, engine control room, entrance of the E/R, propeller tank etc.

The fire alarm and general alarm system are to be of a common group system.

5.9.6 CO2 Releasing Pre-Alarm System

One (1) set of CO2 releasing pre-alarm system to be installed as follows:

Remote release alarm box	CO2 room
CO2 release pre-alarm box	CO2 room
CO2 release pre-alarm repeater	Wheelhouse
Light & Buzzer alarm siren	Engine room Propeller tank Incinerator room

Power of the system is to be fed from D.C. 24V.and A.C.220V.

The ventilating fans, oil pumps in engine room shall be shut down automatically when this alarm is operating.

5.9.7 Group Alarm System

One (1) group alarm relay box is installed in engine control room .About five (5) pieces of combined group alarm panel to be installed in engine room、 workshop space and propeller tank for audible and visible alarm of general alarm, fire alarm, CO2 releasing alarm, telephone calling, telegraph and engine trouble alarm.

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

5.9.8 Electric Crystal Clock

One (1) set of crystal master and slave clock system to be installed as follows:

1 - Master clock	Chart space
Slave clocks	
1 - Three (3) hands (with silent time)	Near radio console
3 - Three (3) hands	1– Wheelhouse 1 –Engine control room 1 –Crane control room
22 - Two (2) hands (single face)	Captain's room、 Chief engineer's room、 office room、 galley、 hospital、 mess room、 gymnasium、 conference room、 one suite etc.

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

5.9.9 Radio Equipment

1) GMDSS

One (1) set of console type radio station to be installed in W/H as follows (or maker's standard):

a) MF/HF radio equipment

- 1 - MF/HF SSB radiotelephone abt. 150W
- 1 – Transceiver
- 1 - DSC watch receiver
- 1 - DSC terminal
- 1 - Battery charger
- 1 - Transmitter antenna
- 1 - Receiver antenna
- 1- Handset

b) VHF Radio telephone

- 2 - International VHF radio telephone with DSC.

c) Satellite communication system

- 1 – INMARSAT standard C ship earth station with EGC receiver

2) INMARSAT-F station includes:

A set of INMARSAT-F station includes:

Main communication unit、 Handset、 FAX、 Telephone and socket、 Antenna

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

3) NAVTEX Receiver

One (1) set of NAVTEX receiver to be installed as follows:

1 – Receiver Chart space

1 – Antenna Compass deck

The power supply is to be fed from A.C. 220V and D.C. 24V.

4) Two-Way VHF Radio Telephone

Three (3) sets of two-way VHF radio telephone and (3) sets battery charger to be provided.

5) EPIRB (406MHZ)

One (1) set of 406MHZ Emergency Position Indicating Radio Beacon (EPIRB) to be provided on compass deck.

6) Radar Transponder

Two (2) sets of radar transponder (9 GHZ) are to be provided.

7) SSAS

One (1) set of Ship Security Alert System (SSAS) in compliance with the requirement of SOLAS XI-2 to be installed.

8) Handset radio interphone

Six (6) sets of handset radio interphones and (6) sets battery charger to be provided.

5.9.10 VHF-AM System

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

5.9.11 NDB System

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

5.9.12 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.

5.9.13 Ref. Chamber 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.

5.9.14 Infirmary Calling Alarm System

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.

5.9.15 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.

5.9.16 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.

5.9.17 Entertainment Equipment**1) Public Address & Satellite Television System**

One (1) set of Public Address & Satellite Television System to be installed
To be fed from 220 volts A.C.

2) Local Area Network (LAN)

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

Server、ups、 exchanger and router.