3840kW Voith Tug

Technical Specification

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Part 1 General Provisions

1.01 General

This technical specification is to be a directive document for the construction of two (2) Voith tugs driven by 3840kW main engine and with a propulsion plant of Voith-Schneider (hereinafter referred to as “the ship”).

The design, construction of the ship is to be in compliance with the rules and regulations of China Classification Society（CCS）for the tug engaging in the coastal towing and offshore navigation and also, in accordance with this technical specification and the General Arrangement Plan (Drawing No: VFX632-100-03）.

The ship is to be used in Yangshan Port as an aid and escorting vessel during the berthing and mooring operation of large ships. It shall feature external firefighting function, powerful towing and pushing capability, good stability, maneuverability and safety.

The ship is to be designed and constructed to meet the requirement that the harbor operation should be carried out by a complement of four (4) persons at a minimum.

The material and equipment to be used in the construction of the ship shall be completely new, in compliance with the requirement of CCS and provided with conformity certificates. The propulsion plant, main engine, deck machinery and external firefighting equipment of the ship shall be imported and supplied by the Buyer (refer to List of Buyer-supplied Items in Part 6). When such equipment arrives and clears in, the Seller shall be fully responsible for the receiving, transportation, warehousing, unpacking and inspection, installation, testing and commissioning. In case any technical or quality problems occurred the Seller shall be responsible for contacting with the equipment suppliers to solve such problems and signing necessary documents concerned.

The Seller shall bear solely all the responsibilities to the whole design, construction, workmanship and quality and shall not diminish its responsibility to possible loss (including possible delayed delivery) caused by its negligence on the reason that the drawings have been approved by the Buyer.

Necessary allocations not specified in this specification but required by the rules and regulations and/or by maritime authorities as listed in Section 1.05 shall be provided by the Seller and on the Seller’s expenses.

1.02 Working environment

All machines and equipment of the ship shall be working normally under the temperature and conditions as follows:

Ambient temperature:	45°C
Sea water temperature ：	32°C
Atmospheric pressure, absolute:	0.1MPa
Relative humidity:	60%

1.03 Particulars of the ship

Particulars:

Length overall	about 30.20m
Length of waterline	28.00m
Breadth, molded	11.20m
Depth, molded	4.20m
Draught, light weight	about 2.80m
Draught, maximum	about 5.00m
Displacement, full loaded	about 600t
Speed	≥12.5 kn
Bollard pull, static	≥50.9 t

Main machinery:

Main engine

Manufacturer:	YANMAR
Type:	6EY26
Power:	1920kW
Revolution:	750 rpm
Quantity:	2 units

Propulsion plant（Voith-Schneider propeller）

Manufacturer:	Voith Hydro GmbH & Co.KG
Type:	**Voith-Schneider** 28 GⅡ/210-2
Quantity of blade:	5
Revolution:	76 rpm
Quantity:	2 sets

Stern warping winch

Manufacturer:	Karmoy, Norway
Type:	M361586
Hydraulic pump package:	76 kW，main engine PTO driven
Quantity:	1 unit

Generator set:

Diesel engine:	Cummins, China
Generator:	Siemens, Wuxi China

External firefighting

Manufacturer:	Mengshun (Hong Kong) Co.
Firefighting capacity:	1500m^3/h，water screen（300m^3/h）
Outward fire pump:	715.3kW，main engine PTO driven

Complement:

The ship is to be designed to meet the requirement that the rest room and the berths shall be suitable for the use of 12 crews at a minimum.

1.04 Performance and operational region

1.04.1 Speed

The sailing speed of the ship under 100% rated revolution of the main engines shall be 12.5 knots.

1.04.2 Pull

Static bollard pull：

The static bollard pull of the ship shall be 50.9t under the condition that it is in open waters and at a speed of 0 knot while the main engine is running at the power of 100% MCR.

Dynamic pull：

1.04.3 Operational region

The ship is to be operated in Yangshan Port and its adjacent regions.

1.04.4 Seaworthiness

The ship shall have good wave-going performance and can safely navigate at Beauford wind scale 10. It shall be able to carry out normally the towing, pushing or traversing operation under the condition of Beauford wind scale 9 and wave height of 3m. It

shall meet the requirement that the ship can safely send or pick up a pilot under the condition that the wave height is 4m. (The above-mentioned seaworthiness shall be guaranteed by Vioth Company.)

1.04.5 Endurance

Endurance of the ship (at a speed of 12.0 knots) shall be equal to or more than 1200 nautical miles.

1.04.6 Vibration and noise

Vibration of the ship shall meet the requirements for the vibration of a seagoing ship as specified in Standard GB7452-87—Evaluation Criterion for Hull Vibration.

Noise level of the ship, when it is measured according to the method specified in Standard GB5979-86—Noise Level for Seagoing Ship, shall meet the following requirements:

Wheelhouse	≤70 dB
Cabins and mess room	≤70 dB
Engine monitoring room	≤80 dB

1.05 Rules and regulations

The ship is to be designed and constructed in accordance with following rules and regulations:

1) Rules and Regulations for the Construction and Classification of Steel Seagoing Ships of China Classification Society, currently in effect (hereinafter referred to as "Rules")
2) Technical Regulations for Statutory Survey of Seagoing Ships Navigating in Domestic Waters as part of the "Regulation for Survey of Ships and Offshore Installations" (2004) of Maritime Bureau of the People's Republic of China (hereinafter referred to as "Regulations")

1.06 Language and unit of measure

Technical documents in relation to the design and construction of the ship shall be written in Chinese unless otherwise mentioned. All measuring units to be adopted shall be legal units of measurement of the People's Republic of China.

1.07 Classification, registry and notations

1.07.1 Classification

The ship shall be classified as ★CSAD.

1.07.2 Registry

The ship shall be registered at Shanghai Port.

1.08 Name plates and markings

1.08.1 Name plates

Name plates made of brass and written in Chinese shall be provided for the cabins and rooms, equipment, electric control cabinets and valves on board the ship.

1.08.2 Identification marks

Ship name and registry port mark shall be cut from steel plate in thickness of 6mm and written in Chinese and *Pinyin* whose form and size shall be approved by the Buyer.

1.08.3 Draught mark and load-line mark

Draught mark and load line mark shall be made of steel plate in thickness of 6mm by means of cutting to the requirement of the Regulations.

1.09 Design requirements

1.09.1 Design standard

The design of the ship shall be responsible by the Seller in accordance with this Technical Specification, the Rules and the Regulations.

1.09.2 Drawings and technical information

1.09.2.1 Buyer's approval of the drawings

On completion of the technical design, the Seller shall submit to the Buyer three (3) sets of design drawings for the latter's approval. An exchange of design intention shall be held between both parties and the Buyer's representative shall be invited to approve the drawings at a place agreed by both parties. The Seller shall determine a schedule for the drawings approval and be responsible for the arrangement and affairs of the drawings approval meetings. The construction of the ship shall not be commenced before the completion of the drawings approval.

1.09.2.2 CCS approval of the drawings

The design drawings approved and signed by both partied shall be submitted to CCS for review and approval.

The Seller shall inform in time the CCS approval conclusion and comments (if any) to the Buyer.

One (1) set of the CCS approved design drawings with CCS approval stamps shall be submitted to the Buyer.

1.09.2.3 Construction drawings

Before the commencement of the ship three (3) sets of the construction drawings shall be submitted to the Buyer.

1.09.2.4 Finished drawings

Upon delivery of the ship, three (3) sets of the finished drawings and two copies in compact disk form shall be furnished to the Buyer. All the drawings and lists shall be clearly identified and in standard binding form and put in file cases with unified labeling.

1.10 Construciton and supervision

The Seller shall assume full responsibility for the construction schedule, performance and quality of the ship, and shall not to delay the delivery in any reasons (including the Seller's workmanship, delayed supply of equipment and material, etc.).

Prior to the commencement of the construction, the schedule of the whole construction project shall be submitted to the Buyer; during the construction, a monthly progress report on the construction shall be submitted to the Buyer at the end of every month.

The Seller shall invite representative of the Buyer to supervise the construction and witness the inspections and tests concerned. The Seller shall furnish the representative of the Buyer with necessary facilities, tools, personal protection equipment and office appliance that are necessary for the supervision.

All the inspection or testing items to be witnessed by the representative of the Buyer shall be informed him/her in advance by the Seller.

The problem(s) to be raised by the representative of the Buyer in written form during the supervision shall be replied in written by the Seller within five (5) working days.

The following major construction stages shall not be conducted or proceed until they have been accepted and signed by the representative of the Buyer:

(1) Erection of hull blocks shall not be conducted until the blocks have been inspected, accepted and signed;

(2) The launch of the ship shall not be conducted until the completion of hull erection has been inspected, accepted and signed;

(3) Installation of main engine shall not be conducted until the shaft alignment has been inspected, accepted and signed;

(4) Sea trial and bollard pull test shall not be conducted until the installation and commissioning of various parts have been completed and the mooring test has been accepted and signed by the representative of the Buyer;

(5) Problems to be found during the acceptances of each stage and/or caused again in the work of subsequent steps shall be solved by the Seller soonest possible and be accepted on completion of the work in downstream stage.

(6) Prior to closing any covert or enclosed spaces/items they shall be inspected and accepted by the representative of the Buyer. Otherwise the representative of the Buyer shall have the right to open these spaces and have a check.

1.11 Launch

The Seller shall inform the Buyer in written form the launch date of the ship seven (7) days in advance.

1.12 Tests and trials

1.12.1 Generals

The inclination test program, mooring test program and sea trial program must be approved by CCS and agreed by the Buyer. Otherwise no such tests should be conducted.

The mooring test program and sea trial program shall be prepared in accordance with General Provisions for Mooring test and Sea Trial of Sea-going Ships (GB/T3471-1995).

All statutory tests and trials shall be carried out in the presence of the surveyor of classification society and representative of the Buyer. Otherwise the Buyer has the right to require a re-test to what not witnessed by its representative.

1.12.2 Shop test

When the shop tests of principal equipment (main engine and Voith propeller) to be supplied by foreign manufacturers, and of major equipment (auxiliary engine, main switchboard) to be supplied by domestic manufacturers, the representative of the Buyer shall be invited to attend.

1.12.3 Inclination test

The inclination test shall be conducted in accordance with the inclination test program approved by CCS and the Buyer and the representative of the Buyer shall be informed five (5) days in advance of the test date.

1.12.4 Mooring test

The mooring test shall be conducted in accordance with the mooring test program approved by CCS and the Buyer and the representative of the Buyer shall be informed five (5) days in advance of the test date.

1.12.5 Sea trial

The sea trial shall not be carried out until the mooring test has been completed and the defects found thereof have been corrected. The sea trial shall be conducted in accordance with the sea trial program approved by CCS and the Buyer. The representative of the Buyer shall be informed in written form seven (7) days in advance of the sea trial date.

1.12.6 Bollard pull test

The bollard pull test shall be conducted at the rated revolution of the main engine. The representative of the Buyer shall be informed in written form seven (7) days in advance of the test date.

1.12.7 Test of external firefighting facilities

The test of external firefighting facilities shall be conducted in accordance with the test program approved by CCS and the Buyer. The representative of the Buyer shall be informed in written form fifteen (15) days in advance of the test date.

1.13 Delivery

The ship shall be delivered at the wharf specified by the Buyer. Before the delivery of the ship various tests and trials should have been completed and the performances met the requirements of the Technical Specification. All the spare parts, tools and accessories (to be furnished according as per Annex2 ~ Annex7 of this Technical Specification), certificates, documents have been available. When delivery the ship shall be thoroughly cleaned and without sewage and dirty water in tanks, cabins, rooms and outside walls shall be free from construction defects, mechanical and electrical equipment shall be in good conditions, and all the machines, equipment, pipelines and tanks shall be clean and rustproof.

When delivery following certificates and documents shall be provided:

（1） Certificate Book for the Survey of Ship, one origin copy and one duplicate copy;

（2） Tonnage certificate and Load line certificate;

（3） Oil pollution prevention certificate;

（4） Marine equipment and products certificates issued by CCS;

（5） Compass deviation table;

（6） Builder’s quality certificate;

（7） Ship property rights hand over certificate;

（8） Service and operational instructions, spare part lists of all the equipment and finished drawings and documents.

Following drawings shall be furnished in wooden frames and placed on board the ship at

proper locations:

（1） General Arrangement;

（2） Life-saving Equipment Arrangement;

（3） Fire Control Plan (with CCS stamp).

A complete set of color photos, which show comprehensively and systematically the whole process of the construction from the keel lay-down to the delivery of the ship, shall be furnished in batches to the Buyer. Four (4) photos, to be taken on completion of the ship when there is no man on the deck to show its best appearance, shall be furnished to the Buyer in wooden frames, whose width should not be less than 0.5m.

1.14 Quality assurance and after-sale service

During the construction of the ship the inspection department of the Seller shall carry out inspection and testing according to this Technical Specification, the Rules, the Regulations, and the standard of the shipyard and report in time the inspection results to the representative of the Buyer who is stationed in the shipyard.

Guarantee period of the ship shall be one (1) year counting from the date of delivery. During the guarantee period in case it is found that system damage or equipment failures are caused by the design or construction, the Seller shall dispatch service engineer(s) to the spot within seven (7) days to shoot the trouble and repair at its own expenses. Should the Seller fail to provide service in time when the ship or equipment is in failure, the Buyer shall have the right to handle the repair to ensure safe operation of the ship, and the repair expenses thereof shall be borne by the Seller.

Part 2 Hull

2.01 General

The ship shall be of all welded construction, single deck, transverse framing, with double bottom in the regions of accommodation and engine room and single bottom in other region. Special strengthening measures shall be provided for the structural members beneath the masts, and in way of the stern, stem, well-strut of propeller plant, sea chests, and foundations respectively for main engine, auxiliary engine, outward fire pump, and deck machinery.

Hull structure of the ship shall comply with the Rules with respect to the notations of tug. Structural discontinuity shall be avoided to the possible extent.

Each tank or void compartment shall be provided with at least one manhole.

All the bolts, nuts, hinges and movable part of the rope-sling to be used on open deck shall be made of stainless steel.

2.02 Main hull material and steel treatment

2.02.1 Material for main hull

Steel plates of Grade CCSB shall be used for main hull of the ship and steel plates of Grade CCSA shall be used for its superstructure.

All steel plates to be used for the main hull shall be as practical as possible the products made by the Shanghai No 3 Steel Mill of the Baogang Steel Group.

2.02.2 Pretreatment of steel material

Steel plates and profiles to be used for hull construction shall be grid-blasted (shot-blasted) to class Sa2.5 as specified in Standard GB/T8923-88 《De-rusting Class for Steel Surface》 and coated with shop primer. Before painting secondary rust on the steel that may be caused by welding, hot work or other processing shall be cleaned to class St3 as specified in Standard CB*3230-85 《Evaluation Class for Secondary De-rusting》.

2.03 Hull structure

As specified by the Rules three (3) watertight transverse bulkheads shall be designed to divide the main hull into four (4) compartments as follows:

1）Fore peak tank;

2）Crew quarters/chain locker;

3）Engine room/propeller room;

4）Aft peak tank, water ballast tank, engine monitor room/cargo hold.

2.04 Welding

The hull of the ship is to be of all electrically-welded construction.

Welding Procedures and Specifications shall be prepared by the designers of the shipyard during the construction design in accordance with the structural features and relevant requirements of the rules and regulations and submitted for ship-owner's approval before putting into strictly implementation in the construction of the ship.

2.05 Liquid tanks

The ship shall be designed with foam tank, fresh water tank, fuel oil tank, sludge tank, circulating lube oil tank, water ballast tank and sewage tank. The capacity of each tank shall meet the needs of hull performance and machinery.

Watertight test shall be conducted for each tank in compliance with the rules and regulations.

2.06 Main structure

2.06.1 Shell plating and deck plate

The thicknesses of the hull plating and deck plates shall be calculated according to the Rules, rounded to the adjacent dimensions of material and increased 1mm at least.

The thicknesses for the structural members shall be not less than the values listed below (These values are for reference only. Official values shall be those to be specified by final approved drawings.):

plate keel	14mm
bottom plate, bilge strake, side plating	12mm
aft bottom plate	16mm
stem plate	14mm
main deck plate	10mm
outer wall of deckhouse	8mm
inner wall of deckhouse	6mm
watertight transverse bulkhead	8mm
funnel wall	8mm

Proper camber shall be provided respectively for main deck, lifeboat deck, bridge deck and compass deck to facilitate the drainage.

Shell plating shall be arranged neatly and tidily with a smooth and good appearance.

2.06.2 Bottom structure

The keel is to be of flat plate throughout the whole length of the ship and formed to a required shape at the bow and stern.

The machinery equipment of the ship is to be mounted on the prefabricated foundations which are to be designed with enough strength and rigidity to withstand the weight, load and vibration of the equipment.

Structural members underneath the foundations of main engine and auxiliary engine shall be strengthened with additional side girders. The face plates and webs of the foundation girders shall be increased 2mm ～ 3mm in their thicknesses on the basis of calculations according to the Rules.

2.06.3 Frame

Transverse framing shall be designed for the ship. Web frames shall be arranged at four frame space apart. All the frames shall be in a spacing of 500mm.

2.06.4 Beams and pillars

Deck beam shall be provided at every frame and web beams shall be provided in line with web frames.

Pillars shall be fitted at necessary locations of the deck girders.

2.06.5 Bulwark

Bulwarks with slightly inward inclinations shall be arranged at both sides of the ship. The face plate of the bulwark is to be of bulb plate in breadth of 200mm. Mooring holes shall be provided in the bulwarks.

Scuppers shall be provided in the bulwarks. The locations and free-port areas of the scuppers shall comply with the Rules. Gratings of steel bars in big enough diameter shall be fitted at the scuppers of the bulwarks.

2.06.6 Stern fin and protection appendage for propeller

A stern fin of double steel plate construction shall be fitted under aft bottom of the ship to improve its stability and course-keeping quality. The stern fin shall be made by the shipyard, and its structure and installation position shall be in compliance with the drawings to be provided by the Voith company (propeller manufacturer).

A protection appendage shall be made and installed by the shipyard around the Voith propeller. The configuration and installation method of the protection appendage shall comply with the drawings to be provided by Voith company and the installation work shall be carried out by the shipyard under the guidance of Voith engineer(s).

2.06.7 Anchor arrangement

Two (2) short-shank Hall's anchors (weight ≥ 750kg) shall be provided for the ship. At least six (6) and seven (7) chain shots shall be provided respectively for the portside anchor and starboard anchor.

One (1) unit of hydraulic windlass shall be provided on the fore deck. Main parameters are to be as follows:

① chain lifter capacity × speed: ≥5t×15 m/min;

② diameter of chain: ≥φ24 mm;

③ braking capacity of chain lifter： ≥15t.

Plain type anchor recess shall be adopted for the ship. Double plates and bolsters shall be welded at the openings in the shell plating. Stainless steel plates shall be fitted on the steel shell plating at the locations where the anchors may touch.

Detachable flaps shall be provided for the deck openings of chain pipes. Each chain pipe shall be provided with three (3) water-spraying units. The weight of anchor, the length and diameter of chain cable, the design of chain pipe and hawse pipe shall comply with the Rules. The mounting foundations shall be properly heightened to keep from the water to be brought by the chain cable when hoisting the anchor. Local operational control and wheelhouse operational control shall be provided.

Two chain lockers shall be arranged at the bow, each with ample capacity for the storage of chain cables in specified length. When the entire chains are stored in the chain lockers there should be a space of about 500mm high between the top layer of the chain and the deck. Wooden gratings shall be provided on the bottom and both sides of the chain lockers.

2.06.8 Mooring equipment

Following mooring equipment shall be provided and installed at locations as shown on the General Arrangement Plan:

1) two (2) bollards at the bow, port side and starboard each, whose exposed parts shall be covered with 3mm thick stainless steel plates;

2) two (2) bollards at the stern, port side and starboard each, whose exposed parts shall be covered with 3mm thick stainless steel plates;

3) one (1) stern bollard at the centerline, lower than the bulwark;

4) four (4) mooring holes in the bulwarks, and their inner sides shall be covered with 3mm thick stainless steel plates;

5) one (1) fairlead on after deck.

2.06.9 Tanks

1) Fuel oil tanks shall be arranged port and starboard;
2) Gravity tank shall be arranged;
3) All tanks shall be provided with air pipes, filling pipes, sounding pipes, drain plugs, suction and discharge pipe lines and inspection manholes. Oil tanks and water tanks shall be fitted with level gauges.
4) All tanks shall be tightness-tested and have their insides thoroughly cleaned under the Buyer’s check.
5) Fore peak tank, void space, engine room, sewage tank and chain lockers shall be provided with bilge water suction pipes and strainers.

6) The chain lockers shall have ample capacity for the storage of chain cables in specified length. When the entire chains are stored in the chain lockers there should be a space of about 500mm high between the top layer of the chain and the deck. Wooden gratings shall be provided on the bottom and both sides of the chain lockers.
7) Plain type anchor recess shall be adopted as practicable as possible. Double plates and bolsters shall be welded at the openings in the shell plating.
8) The sewage tank shall also be arranged with a discharge opening on the main deck and fitted with an international standard connector.
9) The slop tank shall be arranged with a discharge opening on the main deck and fitted with an international standard connector.
10) The fuel tanks shall be arranged with a discharge opening on the main deck and fitted with an international standard connector.

2.06.10 Sea chest

Three (3) sea chests shall be provided for the ship, with two main sea chests arranging port and starboard and the third dedicating to the external firefighting system. The wall thickness of the sea chests shall be the same as that of the adjacent shell plating; openings of the sea chests shall be strengthened with double plates. The suction ports in the sea chests shall be 200mm lower than the upper planes of the sea chests. Each suction port on the ship bottom shall be provided with a longitudinal strainer of stainless steel bars, the flowing area of the suction port shall be three times of that of the sea water main. Air pipe of ample bore, compressed air pipe and blowing valve shall be provided for each sea chest.

2.06.11 Hatches and manholes

(1) All tanks and void spaces shall be provided with manholes or handing holes. The manhole shall be in sizes of not less than 600×400mm and fitted with watertight cover.
(2) All fastening pieces for the manhole covers shall be of stainless steel or brass.
(3) The location of each hatch or manhole shall be kept away from the stiffener of the bulkhead as practical as possible.

2.07 Mast and funnel

2.07.1 Mast

Steel mast shall be arranged on top of the wheelhouse on which navigation lights, VHF antenna, radar antenna and thunder arrester, not-under-command light, air horn, mast light, anemometer and weather instruments are to be fitted.

2.07.2 Funnel

Two funnels of upward exhausting type shall be arranged port and starboard each, in which exhaust pipes for main engine and auxiliary engine are to be fitted.

2.08 Doors, windows, ladders, handrails and railings

2.08.1 Doors and windows

1) Each side of the wheelhouse shall be provided with a watertight door. Fixed type aluminum windows shall be arranged in vicinity and double hollow glass shall be selected for the viewing windows as practicable as possible. Each window shall be fitted with a wiper.
2) A weather-tight steel door with a lock and a stainless steel handle and hinges shall be provided each for outer passageways of main deckhouse (including passageways leading to the outside in living quarters and engine room), and for the entrance of the storeroom on the bridge deck. Round aluminum side scuttles with storm covers and in diameter of 350mm shall be arranged in vicinity, among which those for toilets and bath room shall be fitted with frosted glass and their quantities shall be determined during ship design.
3) Meeting room (concurrently mess room) shall be arranged with a fireproof door opening towards outside.
4) One self-closed type Class A0 fireproof and sound insulation door shall be arranged at the entrance of the passageway from engine room to the living quarters.
5) A fireproof door opening towards outside shall be provided for each crew cabin. Stainless steel screen window shall be arranged for the escape of each crew cabin.
6) A fireproof door shall be provided for each of other rooms and inner passageways according to the requirements of the Rules.
7) Aluminum hollow door (with square window) shall be provided at the inner side of the weather-tight door for the outwards-leading passageway on the main deck.
8) Two weather-tight steel doors and air vents as specified by the Rules shall be provided respectively for the battery room and store room. Store room on the bridge deck shall be provided with two weather-tight steel doors to lead to the outside. One fireproof door shall be provided for the inner passageway.
9) One drip-proof steel grating door shall be fitted for the liquefied gas cylinder room.

2.08.2 Ladders, handrails, railings

The treads of outside ladders on board the ship shall be of stainless steel.

Inclined ladders in a clear breadth of 600mm, with steel treads and handrails of stainless steel profile, shall be provided for each inner space. Steel inclined ladders in a clear breadth of 600mm shall be arranged outside the deckhouse. Steel inclined ladders in a clear breadth of 800mm shall be arranged for the engine room.

Big crew space shall be provided with portable type foldable escape ladder.

Steps of stainless steel checkered plate shall be arranged in suitable height below each weather-tight door of the outer passageway on the main deck.

Storm rails shall be arranged for the outer passageway of deckhouse.

The heights of all the railings shall comply with the Rules, detachable rails shall be fitted in way of the life rafts.

Guard rails of stainless steel pipes in wall thickness of about 10mm shall be arranged at the bow and stern of the ship.

Steel vertical ladder shall be arranged between wheel house deck and compass deck.

2.09 Hull painting

Quality marine paints of international brand shall be used.

The color of the paint shall be determined during the drawing approval according to the Buyer's requirements.

Painting scheme of the ship shall be prepared according to the paint manufacturer's recommendation. The film thickness and the coats of painting shall follow the painting systems recommended by the paint manufacturer.

Hull plating below the waterline shall be applied with paints of epoxy series (primer, finish paint and anti-corrosive paint); hull plating above the waterline including the bulwark shall be applied with paints of epoxy series (anti-corrosive paint, shell paint); epoxy series paint shall be applied to the vicinity, the ceiling and floor fittings before they are covered by decoration panels; decks and deckheads shall be applied with paints of epoxy series (anti-corrosive paint, deck paint); fresh water tanks shall be thoroughly cleaned to white metal and applied with non-toxic epoxy water tank paint.

The life of the anti-corrosive paints below the waterline shall be the same as that of the zinc plates.

2.10 Hull protection

Suitable measures shall be provided for the ship to prevent the hull structural members from excessive corrosion.

2.10.1 Rubber fender

Rubber fender of Model W plate type shall be fitted vertically at the stern as shown in the General Arrangement Plan of the ship.

2.10.02 Cathodic protection

Sacrificed anodes of zinc blocks shall be fitted on the hull plating and the sea chests. The dimensions, quantity and fitting positions of the zinc blocks shall meet the requirement that the zinc blocks are replaced every three years.

2.10.03 Marine growth preventing system

A set of electrolytic anti-corrosive and anti-fouling system shall be provided for

the ship. Anti-corrosive and anti-fouling electrical poles shall be arranged at the sea chests, and impressed current will be applied to exert a cathodic protection to prevent the marine growth from attaching and prevent the pipe lines from corroding. The life of the sacrificed anodes shall be five (5) years.

Part 3 Deck machinery

3.01 Windlass

Two (2) short shank Hall' anchors shall be arranged for this ship, each with a weight of more than or equal to 750kg，the length of portside anchor chain shall be not less than six（6）shots, the length of starboard anchor chain shall be not less than seven (7) shots.

One hydraulic windlass shall be arranged at bow，its main particulars are as follows:

① chain lifter capacity×speed： ≥5t×15 m/min；

② anchor chain diameter： ≥φ24 mm；

③ chain lifter braking capacity： ≥15t；

④ drum first layer pulling force×speed： 4.2t×17.5m/min

⑤ drum top layer pulling force×speed： 1.6t×44m/min

⑥ drum braking capacity： First layer 60t

Third layer 40t

Plain type anchor recess shall be adopted for the ship, doubling plate and bolster shall be arranged at the opening of the shell plating. Stainless steel plate shall be added to the hull area touched by anchor.

Detachable flaps shall be arranged at chain pipe deck opening，three (3) water-spraying units shall be arranged for each chain pipe. Anchor weight, chain length and diameter, chain pipe, hawse pipe shall be in accordance with requirements of the Rules. Installation foundation shall be suitably heightened to prevent water brought onboard by anchor chain from entering when hoisting the anchor，operation control point shall be arranged at windlass side and wheelhouse.

Two chain lockers shall be arranged at bow of this ship, each with sufficient capacity for storage of required length of anchor chain, when the entire chain is stored in the locker, about 500mm space shall be left between top layer of the chain and the deck. Bottom and both sides of the locker shall be arranged with wooden gratings.

3.02 Winch

One (1) winch shall be arranged on the poop deck，its main particulars are as follows:

Warping capacity

1）First layer： towing capacity 15 /7.5 （t）

Speed 17.5/35 (m/min)

2）Second layer： towing capacity 9.5/4.5 （t）

Speed 20/40 (m/min)

3）Fourth layer：towing capacity 7.4/3.5 （t）

Speed 24/48 (m/min)

Braking capacity： first layer≥180t

Braking type: hydraulic type brake with friction type clutch to be adopted，it can be remotely controlled in wheelhouse.

Driving type： Driven by hydraulic motor. Towing line pulling and releasing as well as speed control shall be operated by control valve.

Control method： Wheelhouse remote control and winch side/local control method. Maneuvering device, and hydraulic and electric indication instrument and warning units shall be furnished for wheel remote control console. One (1) control console shall be arranged at winch side.

3.03 Hydraulic system for deck machinery

Hydraulic system for deck machinery shall be consisting of following components，

Hydraulic motor

One (1) primary hydraulic motor shall be provided，which is main engine connected PTO driven. One (1) emergency hydraulic motor shall be provided，which is electrically driven.

Hydraulic oil tank

Hydraulic oil tank shall be consisting of filter for hydraulic oil, cooler, level gauge and other necessary protection part.

Servo-pump is used for remote control

3.04 Hawser ropes

Ropes shall be furnished in accordance with the requirements of CCS Rules, particulars are as follows:

（1）Φ54mm×250m（breaking strength>1650 kN）steel cable ＋ one (1) Φ60mm×20m terylene-nylon hawser rope；

（2）One (1) DiNi(?) hemp mooring rope Φ60mm×180m（breaking strength >500kN)；

（3）Three (3) terylene-nylon mooring ropes Φ55mm×60m（breaking strength >500kN)；

Diameters of the above ropes are all measured in free condition, length is measured under the free condition that both ends of the rope are made with loops.

Part 4 Cabin arrangement

4.01 General

Complement of this ship is twelve (12) persons，living quarters for 12 persons are required，wardrobe, mess gear and other daily necessities for sixteen (16) persons shall be arranged.
Future convenient cleaning and maintenance shall be considered for cabin arrangement during design and construction stage. Clear height of wheelhouse and each cabin after furnishing shall be not less than 2.1m.

As illustrated in General Arrangement Plan，cabins are arranged as follows:

Navigation deck：

Wheel house

Main deck：

Captain’s room

Chief Engineer’s room

Conference room

Two (2) person lounge

Gallery

Closet

Battery room

Storage room

Engine room：

Monitoring room

Materials storage room

Two lounges for four (4) persons each

4.02 Cabin devices

Each cabin shall be consisting of following equipment:

4.02.1 Wheelhouse devices

One (1) set of centralized maneuvering console for separate control of main engine, propulsion, winch and fire fighting gun shall be arranged in wheelhouse；

One (1) maneuvering chair with slide rails shall be arranged in wheelhouse；

One (1) central control panel for wheelhouse.

Fire alarm unit，marine public addressing equipment，DGPS，sounder，radar，compass，VHF telephone， MHF radio station ， other navigation assistance and wireless telecommunication equipment.

One (1) sea chart table shall be arranged in wheelhouse（provided with soft glass table panel），

One (1) marine clock， one (1) set of clinometers， one (1) tachometer, one (1) dry-and wet-bulb thermometer.

One (1) set of separate body ceiling-suction air conditioner.

4.02.2 Captain's room

One (1) single bed（with drawers）
One (1) writing desk
One (1) revolving chair
One (1) set of leather combined sofa for two persons
One (1) single door wardrobe
One (1) book shelf
One (1) recorder
One (1) quartz clock
One (1) internal program-controlled telephone
One (1) safe case
One (1) keys box
Coat and hat hooks

4.02.3 Chief engineer's room

The arrangement is the same as that of the captain's room except for safe case and keys box.

4.02.4 Two person lounge

One(1) double bed（with drawers）
Two (2) single door wardrobes
Two (2) book shelves
One (1) internal program-controlled telephone
Coat and hat hooks

4.02.5 Conference room

One (1) mess table（pillars are of stainless steel pipe）

Four (4) folding chairs and one (1) set of fixed cowskin sofa（storage drawer arranged at lower part）

One (1) multipurpose cabinet（Top tier for TV set，lower tier for audio devices and teaset）

One (1) 32 inch LCD color TV set，one (1)set of film playing and TV system（at least including DVD，power amplified mixed acoustics equipment，5.1 speaker chamber and etc），one (1) set of antenna amplifier shall be arranged

One (1) marine clock

One (1) interior program controlled telephone

One (1) VHF telephone monitoring speaker

Four (4) stainless steel ash trays

One (1) dry-and-wet bulb thermometer

One (1) white board

One (1) cabinet for miscellaneous items

4.02.6 Galley

One (1) A0 class fire retardant door leading to inner aisle shall be arranged, one (1) φ300 aluminum alloy side scuttle shall be furnished on side wall.

One (1) set of liquefied gas-fired double-range cooking device with flameout protection function shall be furnished, for twelve (12) persons.

One (1) set of single range electromagnetic cooking device（non-fixed type, for portable use）

One (1) microwave oven

One (1) 200L double door refrigerator (Brand: Haier or similar grade)

One (1) set of stainless steel kitchenware together with pantry table and wash basin shall be furnished.

One (1) sterilizing machine

Two (2) pressure cookers

Two (2) electric cookers

One (1) stainless steel rice bucket（100kg）

One (1) set stainless steel exhaust machine

One (1) trash can

Cooking pans，basins，tea set， cutting tools，tea kettle，electric kettle，dough basin and other tableware and cleaning equipment shall be furnished for twenty (20) persons.

One small cabin shall be made by use of steel bulkhead in kitchen as liquefied gas room for storage of two (2) gas bottles with a weight of 15kg each，the door of the cabin shall be opened outward，anti-drip type louver shall be fixed on the door.

4.02.7 Water closet

Ceramic tiles shall be adopted for wall decoration of bathroom，closet and toilet，ceiling of those areas shall be furnished by glass fiber or aluminum alloy gusset plate

One shower rose shall be arranged in bathroom.

One (1) wash basin shall be arranged in water closet（marble table-board with stainless steel drain trap），with wall mirror， width of the mirror should be the same as the tableboard.

One (1) set of change locker shall be arranged，with coat and hat hooks，soap box.

One (1) fully automatic washing machine with drying function shall be furnished，Haier or similar brands shall be adopted.

One (1) stool for squat gesture shall be arranged in the toilet，one (1) storm handrail and tissue paper rack also provided.

* All the sanitary wares, taps and drain traps shall adopt the brand of American Standard or TOTO.

4.02.8 Four person lounge

Two (2) two-tier beds（lower bunk with drawers）

One (1) wall cabinet for miscellaneous items shall be furnished for each bunk of the two tier bed

Four (4) lockers for clothes change

One (1) writing desk, One (1) revolving arm chair

One (1) low wooden cabinet

One (1) quartz clock

One (1) internal program-controlled telephone

Coat and hat hooks

4.02.9 Engine monitoring room

Main switchboard

Warning panel cabinet for main engine, Voith propeller and other equipment.

Telephone

One (1) writing desk, one (1) revolving chair

Marine clock

Clinometer

Dry-and-wet-bulb thermometer and white board（specification decided at site）

Insulation rubber to be covered on floor

One (1) filing cabinet

One (1) set of water cooled air conditioner

4.03 Air conditioner

One (1) warming and cooling central air conditioner shall be furnished onboard;
One (1) separate body top-suction type air conditioner shall be furnished in wheelhouse;
One (1) water cooling air-conditioner shall be arranged in control room.

4.04 Domestic hot water system

One (1) set of A.O. Smith electric heater shall be arranged at suitable place as hot water source for crew members.

Part 5 Outfitting

5.01 General

5.02 Wooden outfitting

5.02.1 Floor

Floors of the wheelhouse，accommodation cabins，mess room and inner aisle shall be furnished with fire retarding deck coverings, and on them, fire retardant，anti-slid，wear-resistant rubber flooring shall be provided；floor of engine monitoring room shall be furnished with floating deck coverings，and on it, fire retardant，anti-slid，wear-resistant rubber flooring shall be provided；galley, bathroom and toilet shall be furnished with anti-skid floor tiles；checkered steel plates shall be arranged in engine room and engine shed，relevant equipment shall be surrounded with flat bars；a fixed working platform（with steel plates coaming）shall be arranged at bow fore deck，nearby area of fore winch shall be furnished with stainless steel checkered plates，and fixed by stainless sunk screws.

5.02.2 Bulkhead, trunk and ceiling

Interior side of the steel trunk of engine monitoring room shall be furnished with 100mm thickness rockwool panel, exterior side shall be furnished with high sound—absorbing compound rock wool panel，wall and ceiling of the mess room，crew cabins，inner aisles shall be furnished with 30mm thickness plastic-faced compound rock wool panel；galley shall be furnished with stainless steel compound rock wool panel；four sides of the wheelhouse shall be furnished with 30mm thickness plastic-faced compound rock wool panel，ceiling shall be furnished with 30mm thickness plastic-faced compound rock wool panel. All the furnishing work of compound rock wool shall be made in an orderly, clean and beautiful way，insulation work of the entire ship shall be made according to fire retardant division requirement，all the bulkheads to be exposed to the weather and the top deck shall be furnished with 50mm thickness rock wool as thermal insulation layer.

Color of each trunk and ceiling shall be decided when the ship drawings are submitted for review, it shall be approved by the Buyer.

5.02.3 Wooden furniture

Furniture drawings for cabins, mess room multipurpose cupboard shall be made in accordance with general arrangement plan and approved by the Buyer，all the furniture shall adopt wooden sandwich construction panel, surface of which shall be furnished with fire retardant overlay，the furniture shall be manufactured and installed by specialist makers. Color of the furniture shall be approved by the Buyer.

Part 6 Fire fighting and life saving appliances

6.01 General

This ship shall be furnished with life jackets, life buoys, life signal and inflatable life raft in accordance with the Rules, a set of fireman's outfit shall be arranged for this ship.

A sufficient number of fire extinguishers and fire fighting apparatus shall be provided.

6.02 Life apparatus

6.02.1 Life raft and life buoy

This ship shall be furnished with one (1) inflatable life raft which is in compliance with the requirements of the Rules.

This ship shall be furnished with six (6) life buoys，all of which are provided with life line, two of which are required to have self-igniting lights and smoke signals .

6.02.2 Life jacket

This ship shall be furnished with fifteen (15) life jackets. They shall be either placed in respective crew lounge room or stored collectively in one life jacket locker arranged in suitable space.

6.03 Inboard fire fighting

6.03.1 General

Fire fighting water of water fire-extinguishing system for this ship shall be supplied by one general fire fighting pump as well as one bilge and ballast pump inside the engine room. Arrangement of fire hydrants and fire extinguishers shall be in compliance with requirement of the Rules, fire fighting water system pipelines shall also be used for deck flushing, and anchor chain flushing. When the capacity of general fire fighting pump is determined, it shall be able to meet the requirement that it will act as a standby sea water cooling pump for the main engine.

6.03.2 Fire extinguishers

Amount and types of the fire extinguishers onboard shall be furnished as requested below（following medium and amount for extinguishers are for reference only, results of approved drawings shall prevail）:

Place	Medium	Capacity	Quantity
Engine room	Dry powder	6L	3
	Foam	9L	2
	CO_2	--	3
	Foam extinguisher for onboard use	45L	1
Galley	Dry powder	6L	1
Living quarters	Dry powder	6L	5
Wheelhouse	CO_2	--	1
	Dry powder	6L	1

6.03.3 Fire hydrant

Fire hydrants for this ship shall be arranged in accordance with marine standard，its amount are as follows：

（1） Main deck, stern，one (1)；

（2） Main deck, bow，one (1)；

（3） Engine room，each one at forward and aft.

Every fire hydrant shall be equipped with 20m hose，and they shall be put in nearby areas.

One (1) international shore connector shall be furnished.

6.03.4 Fire alarm system

One (1) set of fire alarm system shall be arranged in engine control console in the wheelhouse for fire alarm purpose，after a delay of 120 seconds of fire alarm, general alarm board will be connected.

Arrangement of fire detectors are as follows：fire alarm button and smoke-sensitive detectors shall be arranged in corridors on upper deck and main deck，temperature-sensitive detectors shall be arranged in galley. Smoke-sensitive detectors and fire alarm button shall be arranged in engine room and Voith propeller room. Temperature-sensitive detectors shall be arranged in crew cabins.

6.03.5 Fireman’s outfit

One (1) fireman’s outfit shall be furnished and placed in suitable place. Every set of

fireman's outfit shall be consisting of：air-breathing apparatus, protective mask, helmet, gloves and boots, fireproof lifeline and fire fighting axe.

6.04 External fire fighting system

6.04.1 General

This system is furnished with one (1) set of fire pump, fire pump set is driven by clutch and gear box connected at the free end of left main engine. Each fire fighting gun shall be arranged at portside and starboard of the compass deck respectively，fire fighting gun are required to be able to use rinsing water and foam, fire fighting capacity of each gun shall be able to reach 600m^3/h，fire fighting gun can be either remotely operated by the handle fixed in the navigation console，or operated through manual method at the gun side.

Water screen with a flow rate of 300m^3 shall be furnished.

For detailed specification and installation requirement of the outboard firefighting system, please see the product specification provided by maker.

6.04.2 Fire fighting pump set

One (1) set of external fire fighting pump with a rated capacity of 1500m^3/h – 140mwc shall be furnished onboard，this pump shall be PTO driven by left engine.

6.04.3 Fire fighting gun

Two (2) sets of fire fighting guns with a flow rate of 600m^3/h shall be furnished onboard.

Control method：	Electric remote control
Emergency maneuver：	Manual turning wheel control
Rotating magnitude：	Horizontal ±165^0
	Vertical +70^0 - -70^0
Material：	Stainless steel and bronze
Driving type：	Motor-driven

6.04.4 Control module

One (1) control module shall be supplied and integrated into wheelhouse by shipyard for the purpose of remote control of fire fighting pump station and fire fighting gun.

Following units shall be included：（all the switches are required to be with indication

lights）

Fire fighting gun control:

One (1) power source switch with indication light (220VAC,1 phase, 50Hz)

One (1) control switch with indication light for the exchange of wheelhouse control/hand held controller

Two (2) handles for control of fire fighting gun turning in left, right, front and back direction.

Two (2) buttons for switching control between spout ejection type and spray ejection type of fire fighting gun

Clutch control:

One (1) 24VDC power source with indication light

One (1) fire fighting mode indication light (only when the fire fighting mode instruction is received, can engaging operation for clutch be allowed, fire fighting mode signal is provided by main engine/Voith propeller system, after the clutch was engaged, one set of signals will be transmitted to main engine/Voith propeller system for interlocking)

One (1) silencing button

One (1) set of buttons with lights for control of the clutch

One (1) high temperature warning indication light

One (1) system low oil pressure warning indication light

One (1) clutch low oil pressure warning indication light

One (1) buzzer

Part 7 Navigation and communication equipment

7.01 Navigation lights and signal lights

In accordance with the Rules, DC24V double bulb type navigation lights and search lights with stainless steel housing shall be furnished onboard. All the navigation lights and signal lights are all powered by two lines of DC24V power sources：one line shall be supplied by the power after AC220V / DC24V transformation from main switchboard，the other line powered by DC24V emergency charging/discharging board.

Spare parts delivered with the ship shall be in compliance with the requirements of unrestricted navigation zone stipulated in CCS rules.

7.01.1 Navigation lights

Following navigation lights shall be furnished onboard this ship:

Mast light (white), double bulb type	3 sets
Starboard light(green), double bulb type	1 set
Portside light (red), double bulb type	1 set
Stern light (white), double bulb type	1 set
Towing light (yellow), double bulb type	1 set
Anchor light (white), double bulb type	1 set
Not under command light ,single bulb type	3 sets

7.01.2 Signal lights

This ship shall be furnished with following signal lights：

Portable flash signal light	1 set
Port signal light	1 set

7.01.3 Search lights，projection light

One (1) 1000W imported search light shall be fixed on the top shelter of wheelhouse, housing of which is of stainless steel, it can be electrically controlled by remote method from wheelhouse console. Two (2) sets of light receptacle-assemblies and bulbs shall be provided as spare parts.

Two (2) 500W projection lights shall be furnished at fore and aft ends of navigation deck each.

7.01.4 Siren

One (1) siren shall be fixed on the mast which is on top of the wheelhouse; control button shall be installed on the maneuvering console.

7.01.5 Window wiper

One (1) electrically operated wiper shall be fixed on each window glass of the four sides of the wheelhouse; switch shall be installed on the maneuvering console. The wipers shall be with the function of rinsing as much as possible.

7.02 Telecommunication equipment

Configuration of the wireless telecommunication equipment GMDSS system onboard this ship shall be in compliance with the CCS Rule requirement for A1+A2 navigation zone. Following equipment shall be included:

7.02. 1 Public address system

One (1) 100W loud speaker system （with electronic tuning receiving head）shall be installed in wheelhouse. Two (2) 25W loud speaker（drip proof type）shall be installed in main mast，a certain number of 3W speakers shall be separately installed in wheelhouse, engine control room, mess room and each cabin，two (2) 5W speakers shall be fixed in engine room and Voith propeller room. Two (2) microphones and two (2) remote control sockets.

7.02.2 Sound-powered telephone，program-controlled telephone

One (1) set of sound-powered telephone shall be furnished onboard for convenient contact between wheelhouse and engine monitoring room，the telephone in engine monitoring room shall be furnished with visual and audio display in engine room.

One (1) set of program controlled telephone system consisting of 12 telephones shall be provided onboard, the telephones shall be arranged in wheelhouse, mess room, each accommodation cabin, engine monitoring room and engine room. The telephone fixed in engine room shall be with visual and audio indication function.

7.02.3 Main engine emergency telegraph

One (1) set of emergency telegraph for left and right emergency telegraph respectively shall be furnished in wheelhouse and engine monitoring room and main engine maneuvering position(provided by main engine maker for the complete set)，with audio and visual warning function， power source is DC24V.

7.02.4 VHF telephone

This ship shall be furnished with one (1) JRC or Furuno VHF wireless telephone，one (1) ICOM VHF wireless telephone，one of which shall be with DSC function，power source is AC220V／DC24V， they all adopt rod antenna.

This unit shall be able to work with voice and DSC in single frequency channel or in single and double frequency mode，frequency range is 156.0~174.0MHz. It shall be the specialist digital selection calling duty device which is able to guard and listen continuously in 70 frequency channels, it shall be furnished with the function of visual indication that the equipment is in working condition as well as conducting the transmitting task. With high anti interference ability, it shall not be damaged in case of antenna open circuit or antenna terminal short circuit. One motoring speaker shall be arranged in mess room.

7.02.5 MHF wireless telecommunication unit

This ship shall be furnished with JRC，Furuno or [redacted]mid/high frequency wireless telecommunication unit，with one set mid frequency DSC terminal，they shall be in compliance with the GMDSS requirement，frequency range of the transmitting units shall be：1605~27500 kHz. The selected transmitting frequency shall be clearly recognized in the control panel of the unit. Power source is AC220V/DC24V.

7.02.6 NAVTEX

One (1) set of NAVTEX receiver （JRC or Furuno）shall be furnished onboard,，it shall be arranged in wheelhouse，receiving frequency is 518kHz，powered by AC220V/DC24V source.

7.02.7 Life raft two-way VHF telephone

Two (2) life raft use two-way VHF wireless telephones shall be furnished onboard for site communication between life rafts, life raft and ship, life raft and rescue units.

Norwegian products shall be used.

7.02.8 SART

One (1) SART shall be arranged onboard this ship, it can display the position of the distressed on the radar of the rescue unit by a series of evenly distanced dots，it shall be furnished the anti-accidental starting function, visual or audio unit, or visual and audio unit to indicate correct operation，and remind survivors，SART can also be activated by search radar. Frequency range ： 9200~9500MHz.

Norwegian products shall be used.

7.02.9 800 M group telephone

One (1) 800M group telephone shall be furnished onboard for contact between ship and shore directing.

7.02.10 Sound-controlled voice recorder

One (1) digital sound controlled voice recorder shall be furnished onboard, it can automatically record 8 hour continuous VHF voice signal. It can also record synchronously the voice content and time as the call occurs.

7.02.11 Walky- talky

Two (2) hand-held VHF all-channel walky-talky （Motorola）shall be furnished onboard the ship.

7.02.12 EPIRB

One (1) Emergency Position Indicating Radio Beacon（EPIRB）shall be furnished onboard.

7.02.13 All-frequency antenna

One (1) set of all frequency antenna shall be furnished onboard the ship, TV feedback cable shall be of 75Ω co-axial cable with plastic protection sheath. .

7.03 Navigation equipment

7.03.1 Radar

One (1) marine radar with APPA function and 12 inch display shall be furnished onboard, radar antenna shall be fixed on the mast, maximum display distance shall be ≥48 nautical miles, transmission power ≥6kW, power supplied by AC220V power source.

7.03.2 Sounder

One (1) set of sounder shall be provided in the wheelhouse，power source is AC220V，DC24V.

7.03.3 Anemorumbometer

One (1) set of imported marine anemorumbometer shall be furnished onboard the ship, its type is of N-54C and installed in wheelhouse，power source is AC220V，DC24V.

7.03.4 Repeat magnetic compass

One(1) imported standard compass（vertical），one (1) steering compass (desk type)，dial diameter are both of ∮165mm, lighting power source is DC24V. Steering compass can automatically trace standard compass，indication tolerance are both less than 0.5°.

GPS，radar，AIS connection ports shall be provided.

7.03.5 DGPS

One (1) DGPS shall be furnished in the wheelhouse，power source is AC220V，DC24V.

7.03.6 Weather facsimile recorder

One (1) set of FAX-207 weather facsimile recorder shall be furnished onboard the ship, power source is AC220V，DC24V.

7.03.7 Automation Identification System（AIS）

One (1) set of Automation Identification System（AIS）shall be provided，signals from DGPS, radar and magnetic compass can be received， connector for pilot use shall be furnished， power source is AC220V， DC24V.

7.03.8 Others

One (1) laptop computer with a famous brand shall be furnished for this ship.

Part 8 Main Engine Room Equipment

8.01 General

A double-engined and double azimuthing Voith propulsion system to be adopted in the ship.

(1) Working conditions：

Normal operation and consecutive power to be guaranteed for all machinery and accessories under design conditions as follows:

Atmospheric pressure	0.1Mpa
Ambient temperature	45℃
Relative humidity (RH)	60%
Sea water temperature	32℃

(2) Main engine: Four stroke, single action, direct injection, turbo-charged, inter-cooling system and irreversible type marine diesel engine. The turbo-charger's layout to meet the need of upper fume exhaust.

(3) Propeller: Voith Schenieder propeller.

(4) Diesel engine generators: two diesel engine generator sets to be installed, each serving as standby of the other and transferring load between the two under no power off.

(5) Other mechanical equipment: running consecutively under rated output.

(6) Monitoring room: Displays and audible and visual alarms to be installed under the requirements of the ***Rules and Regulations***. The operation of the main engine and clutches can be remotely controlled in the wheelhouse. The startup and normal shutdown of the main engine to be run beside the main engine and emergency stop button to be installed in the wheelhouse.

(7) The layout of all machinery shall leave proper room for operation and maintenance.

(8) Spare and material storeroom with proper space to be laid out in the engine room or Voith propeller room.

(9) The design, fabrication, construction, material, fittings and accessories of all the machinery to meet the requirements of the ***Rules and Regulations*** and to have product certificates issued by China Classification Society (CCS). Torsional vibration calculation to be made in the design of the shafting and submitted to the classification society for approval.

(10) Daily service fuel oil tank, fresh water expansion tank and lubricating oil storage tank to be laid out in the engine room (with the interior bottom of the daily service fuel oil tank and fresh water expansion tank in the conical shape for blowdown purpose).

(11) All the diesel engines to burn CB252-87 0# light diesel fuel.

8.02 Main engine

The ship to adopt two sets of 6EY26 type marine diesel engine as the main engines: four stroke, single action, direct injection, turbo-charged, inter-cooling, irreversible, energy-saving and environment-friendlly.

Continuous rating: 1920kW

Rated rotation speed: 750rpm

8.02.1 Lubricating oil system of main engine

Self-driven lubricating gear pump, automatic oil temperature regulator, pressure regulating valve, lubricating oil filter, tubular cooler to be laid out for each main engine. An independent lubricating circulating tank to be laid out to meet the lubricating need of the main engine. To prevent the self-driven lubricating gear pump from failure, a standby electric gear pump (supplied in package with the main engine) to be laid out for emergence use.

8.02.2 Cooling system of main engine

Each main engine set to have one self-driven fresh water pump and one electric sea water pump while the lubricating oil cooler, fresh water heat exchanger and air cooler to be supplied in package with the main engine, whose structures are convenient to be maintained and free from air and sewage blockage. Automatic temperature regulator to be equipped to regulate the temperature of the circulating water and oil. General service pump to be reliably connected with the sea water system to serve as standby cooling-water pump of the main engine. One electric fresh water pump to be equipped as standby to be used by the main engine (supplied in the package with the main engine).

8.02.3 Air startup system of main engine

Main engine to be equipped with two startup air cyclinders, whose capacity can start up each main engine set in cold state for six consecutive times without gas charging. The air cylinder, with the maximum startup air pressure of 2.94Mpa (30kgf/cm), to be equipped with safety valve, drainage valve and piping of condensed water.

8.02.4 Exhaust system of main engine

Each main engine set to be equipped with exhaust silencer (with dry spark extinguisher) and suction filter. The exhaust-gas turbocharger’s outlet to be with corrugated

type expansion joint, and the main engine exhaust pipe and exhaust-gas turbocharger to have good thermal protection with the maximum temperature of the external surface less than 60℃.

8.02.5 Fuel oil system of main engine

Each main engine set to be equipped with self-driven fuel oil transfer pump with safety valve, fuel oil twin strainer, single cylinder inject pump, leakage oil collecting tank, fuel injector, and etc.

Bypass pipes to be laid out in the pipelines of the fuel oil supply pump.

8.02.6 Speed control system of main engine

Each main engine set to be equipped with a mechanical hydraulic speed governor (manufactured by Wood Word), controlling the main engine's speed within its whole speed range with good performance. The main engine's speed to be controlled in the wheelhouse or in the engine room.

For oil saving purpose, the rotation speed of the main engine to be fixed at the following stages, controlled by the indicator button mounted on the maneuvering console:

Stage 1	at 100% rpm	full power for towing and free running
Stage 2	at 90% rpm	partial power for work
Stage 3	at 80% rpm	partial power for work
Stage 4	at 60% rpm	minimal work speed
Stage 5	at 40% rpm	Idle speed

Each main engine to have over-speed protection function, meeting the requirements of the *Rules and Regulations*.

8.02.7 Instruments of main engine

Each main engine set to be equipped with the running hour counter. The instruments on the instrument panel to indicate correctly main working conditions during the running of the main engine. The main body of the main engine set to be equipped correspondingly with instruments indicating each part and working conditions of the system. A set of instrument and alarm device also to be mounted in the monitoring room to monitor the running of the main engine.

8.02.7 Documents and drawings of main engine

The manufacturer of the main engine to supply a complete set of product approval

documents, working documents and completion documents, two compact discs and six sets of copies respectively of operating specifications, maintenance instruction and after service manuals, product certificates issued by CCS, Nox certificates and torsion vibration calculation.

8.03 Propulsor

This vessel to be equipped with two sets of 28 RII/210-2 type Voith–Schenieder propulsors.

Turning diameter of blade:	2800mm
Length of blade:	2100mm
Quantity of blade:	5pcs
Material of blade:	drop forged anticorrosive alloy steel
Rotation speed of propulsor:	76rpm

8.03.1 Rotation direction of propulsor

Looking downwards from the top of the propulsor:

Right propulsor:	clockwise
Left propulsor:	counterclockwise

8.03.2 Rotation direction of main engine

Looking from propulsor to output shaft of the main engine:

Right main engine:	clockwise
Left main engine:	counterclockwise

Refer to the technical specifications and installation manual of the propulsors provided by Voith for detailed technical specifications and installation requirements.

8.04 Diesel generator set

The ship to be equipped with two homemade generator sets, with one meeting the requirements of the ship's work and the other serving as standby. The two generator sets can transfer load under no power off.

The prime mover of the generator to adopt homemade CUMMINS diesel engine, which is vertical four stroke, freshwater closed-circuit cooling, direct-injection and irreversibel marine type diesel engine and can match with the generator's power. The generator to adopt homemade Siemens-brand product.

The generator set to be started up by compressed air and equipped with air motor, starting

valve, reducing valve, oil sprayer, safety valve and pressure gauge.

The generator set to have a common foundation, installed in the hull via shock absorber.

Lubricating oil thermometer, lubricating oil pressure gauge and tachometer of the prime mover to be installed on the generator set.

The alarm system to be equipped with the following audible and visual alarms:

High temperature of fresh water (alarm),

High temperature of lubricating oil (alarm),

Low pressure of lubricating oil (alarm and shutdown), and

Over-speed shutdown (alarm).

All the above indicators and alarm signals to extend to the alarm chest in the monitoring room of the main engine and comprehensive alarm to be set on the wheelhouse console.

Part 9 Piping and ship system

9.01 General

All the pumps and pipings of the ship to be laid out according to corresponding requirements of the *Rules and Regulations* of CCS.

All pumps to be of proven marine products and with CCS certificates as required. The products selected to have spares that are easy to find at the market. The impeller of the selected water pumps to be made with bronze and shaft with stainless steel and mechanically sealed. The shafts of the oil pumps to be made with forged steel and mechanically sealed. All sea water pumps to have bronze shell, fresh water pumps to have cast iron shell, and oil pumps to have cast steel shell. All pumps to be equipped with pressure gauges as required.

9.02 Materials and construction requirements of the piping

9.02.1 Piping materials

The piping materials can select 20# high-quality structural seamless carbon steel pipes, hot galvanized steel pipes, stainless-steel pipes and copper pipes, etc. Seamless steel pipes of each specification to be thickening-wall type. The materials of all piping and flanges above the main deck as well as connection bolts and nuts to be stainless steel.

9.02.2 Materials of valves, sea water filters and butterfly valves

Specifications and models of the valves, flanges and accessories of all piping to meet the marine product requirements stipulated in GB and CB standards, and products manufactured by Jiangyan Marine Valve Factory or Hudong Marine Valve Factory to be selected. All the sea/fresh water valves to select cast steel (bronze valve core and bronze or stainless steel valve rod), copper or stainless steel according to its purpose. The valves of the fuel/lubricating oil system to choose cast steel material ones. The valves above the main deck and overboard discharge valves to choose bronze or stainless steel ones. The valves and faucets of living water to choose products with TOTO or American Standard brands.

The filter mesh of the sea water filter and the valve rod, lining and valve core of the sea water butterfly valves to adopt stainless steel materials. The filter mesh of the main sea water filter to be made of hole-drilled stainless steel panel in proper thickness and fastened with the main body.

The sea water valve, sea water filter and bolt and nuts to be fastened with the hull to adopt stainless steel materials.

9.02.3 Gasket materials

(1) Medium and high pressure salamandrite gaskets to be used in sea water system, cooling fresh water system, bilge ballast water system, and lubricating/fuel oil system. Black butadiene nitrile rubber gaskets to be used in compressed air system, drain and leak-off system, oily water sewage disposal system, gas venting system, sounding system and filling system.

(2) Red fluororubber gaskets to be used in daily service fuel oil system.

(3) Red copper gaskets to be used in compressed air system of the main engine (concave and convex flanges).

(4) CS828A spiral wound gaskets or products of the same kind to be used in exhaust system of the main engine with a temperature above 150℃.

(5) White silicone rubber gaskets to be used in water supply system and living water system of the main engine.

9.02.4 Piping preservation

(1) Main sea water pipes, sea water cooling pipes, fire pipes (internal firefighting of the ship) and bilge ballast pipes to be plastic coated inside the pipe wall and preservatively treated by derusting outside the pipe wall. The external firefighting pipes and other types of water pipes to be processed with double-face hot galvanization. Bulkhead-penetrating pipes to have proper measures to prevent its coating from damage. In case the coating is damaged, it to be repaired with proper processes.

(2) When the fabrication of the fuel/lubricating oil piping finishes, the inner walls of the pipes to be coated with medium oil after chemical cleaning. The flushing of the lubricating oil piping of the main engine to be no less than 72h, especially the piping between the lubricating oil fine filter of the main engine and the main engine. During flushing, the pipes to be knocked and shocked constantly to clean out small containment inside the pipes.

(3) Flanges specially used in the hydraulic piping or square flanges of high pressure connection to be chemically cleaned as a whole after finishing the piping fabrication with medium oil coated on the inner wall and anti-rust painted on the outer wall. After installation, the whole system to be oil flushed, lasting longer than 48h.

(4) The compressed air piping to be galvanized after acid cleaning and connection to be made with high-pressure flange or bushing.

(5) All the water-feed pipes in the fresh water tank, vent pipes and sounding pipes to use stainless steel pipes.

9.02.5 Prefabrication and welding of piping

Pipes with a diameter less than 100mm to be bent by pipe-bending machine. Pipes in need of welding-on elbows or bends ,these elbows or bends to be of standard, thickening and qualified products made by qualified manufacturers.

Reducing coupling and floor drains to be of the same materials as those of the pipes, and the wall thickness to be no less than the pipe's wall thickness.

The connection base plate between the overboard discharge valve and discharge outlet to be made of 35# steel. The tip end of the base plate to stand out 10mm to the side plate for the convenience of welding.

All the valve opening in the checked plate of the main engine to be pressed or bored and equipped with foot press type coverage device.

The butt joints of the pipes, the welding of the elbow and the pipes, and the welding of the flanges (high pressure ones) and the pipes to use CO_2 gas shielded arc welding. Each pipe to have proper length for the benefit of future piping maintenance. Each pipe to have only one elbow and no more than two in special cases.

The connection of bulkhead-penetration pipes to adopt sleeve type.

Each variety of piping to go through shop pressure test and onboard system pressure test after installation according to the Seller's building and test processes with the participation of the Buyer's representative.

9.02.6 Piping marking

The piping of the ship to be marked with arrow sign to show the liquid flow direction in the following colors:

Sea water	dark green
Fresh water	light grey
Oily and bilge water	black
Firefighting	red
Fuel oil	iron red
Lubricating oil	deep yellow
Compressed air	sky blue
Hydraulic oil	light yellow

9.03 Ship system

9.03.1 Cooling system

Main sea chests to be arranged at both sides of the engine room, connected by main sea pipes. Each sea chest to have one main sea valve. The sea chest to be equipped with bar filter, whose flow area is three times larger than the cross-sectional area of the main sea pipes. The sea chests to be equipped with air pipes, compressed air pipes and blow valves. Another sea chest to be arranged in the intermediate back of the engine room, independently used by external firefighting sets.

The self-driven pumps and other electric pumps of the main/aux. engine to absorb water from main seawater pipes. The design of seawater filter and the bore of seawater pipes to meet flow quantity requirements in case of simultaneous seawater use by all equipment of the ship and no phenomenon of scrambling for water to appear.

The cooling system of the main/aux. engine to be configured as required by the ***Rules and Regulations***. General service pumps to serve as standby seawater cooling pumps of the main/aux. engine. The standby freshwater cooling pumps of the main engine to be configured independently. The air-conditioned cooling pumps to serve as the standby seawater cooling pumps of the auxiliary engine. The cooling water for Voith propeller and clutches to be supplied by the cooling system of the main engine. The cooling system's freshwater supply of the main/aux. engine to be made by the water pressure tank.

9.03.2 Fuel oil system

This system includes fuel oil transfer, supply and discharge. It to consist of two fuel oil transfer pumps (one as standby), one flow meter in the oil pipeline to the daily service oil tank and one fuel oil filter with adequate flow area. The daily service oil tank to be equipped with self-closed glass liquidometer and low-level alarm device and to make it possible for the fuel oil transfer pumps to supply oil automatically or manually. In the fuel oil system, all residual fuel to be discharged to the dirty oil tank and to be transferred ashore via dirty oil pumps.

The filling inlets of the fuel oil tanks to be separately laid out in proper locations at both sides of the main deck so that the fuel oil tank can be charged at each side. The outlet of the air pipes to be equipped with the flame screen. The upper deck to be equipped with the engine room speed-cut valve chest. In case of fire accident in the main engine, the daily service oil tank in the main engine can be shut off by remote control. Other kinds of allocations and alarm devices to be configured according to the ***Rules and Regulations***.

9.03.3 Lubricating oil system

This system to consist of lubricating oil transfer, supply and discharge. It to be equipped with lubricating oil circulating tank and lubricating oil storage tank and independent filling inlet laid out in the main deck. The lubricating oil of the main engine to be supplied by main engine-driven lubricating oil pumps via lubricating oil cooling unit, temperature regulating valve, lubricating oil cleaner to each lubrication point. In case of malfunction of the main engine-driven lubricating oil pumps, or pre-supply of lubricating oil before starting up of the main engine as well as pumping ashore lubricating oil from the lubricating oil tank, the function to be fulfilled by standby lubricating oil pumps of the main engine. The Voith propeller, diesel engine generating sets and firefighting sets to contain lubricating oil pumps with themselves and form independent lubricating oil circulation systems. For convenience of oil-quality monitoring, lubricating oil sampling valve to be laid out in the pipelines between the main engine and its condenser (one at each engine). The waste oil of the lubricating oil system and other kinds of residual oil to be discharged to the dirty oil tank. Other kinds of configuration and alarm devices to be laid out according to the *Rules and Regulations*. The lubricating oil circulating tank to be equipped with one set of mechanical level display unit.

9.03.4 Compressed air system

This system to consist of compressed air systems for startup of the main engine and the diesel generating sets and compressed air system for miscellaneous use.

This system to include two sets of main air compressors, two sets of main startup air cylinders and one air cylinder for startup of the auxiliary engine and miscellaneous use. The two sets of air compressors can supply air respectively or simultaneously and automatically start or stop according to the pressure of the air cylinders. The air compressor charges the main startup air cylinder directly via gas, oil and water separator. Additionally, one set of manual emergency air compressor to be configured with a displacement of $0.1m^3$/min.

The main startup air cylinder to supply air to the main engine starter and auxiliary air cylinder.

The compressed air capacity of the two sets of main startup air cylinders to meet the requirements of six times of cold startup of the two main engines. The compressed air pressure of the main engine's startup to be determined according to the main engine's requirement.

The remote control air of the main engine to be supplied by main air cylinder after pressure reduction and filter via air source panel.

The auxiliary air cylinder to supply air for diesel generating set's startup and

miscellaneous use of air source of air/fog whistle, flushing of sea valves and blow wash of the engine room and the deck.

9.03.5 Living water system

A set of combined type sea/fresh water pressure tank, made of stainless steel, to be located in the engine room. The combined type water pressure tank to have one sea/fresh water pump and one standby pump of the same specification (referring to 3.2.5 for the materials), mounted on the body of the water pressure tank. A pressure relay to be mounted on the tank body to control the pumps automatically. The water pressure tank to supply fresh water to the galley, bathroom, main/aux. engine expansion tanks, and etc. The gravitation water tank to be connected with the outlet pipe of the fresh water pressure tank. The sea water pressure tank to supply sea water to places like toilets.

The pipes of living fresh water and hot water to be all made of stainless steel. The wall thickness of the pipes can meet the requirements of water pressure intensity.

9.03.6 Exhaust system

The main/aux. engine and diesel engine for fire control to adopt the type of upper fume exhaust and double funnel. The engines to discharge via the supercharger's outlet through the expansion joint, exhaust silencer with spark extinguisher and exhaust pipe to the atmosphere.

Expansion joints and supports to be laid out in proper places of the whole pipeline. The exhaust pipes of the main/aux. engine and diesel engine for firefighting to be wrapped with insulating materials and the external surface temperature of the exhaust pipes after thermal insulation wrapping shall not exceed 60℃.

9.03.7 Bilge ballast water system

This system to have one self-priming bilge and ballast pump. The main fire pump and bilge pump to serve as standby of each other or use jointly.

The bilge well to be located at proper spaces of both sides of the engine room. Both sides of the bilge well to have direct bilge mouth and bypass mouth. The bilge bypass mouth to have unidirectional non-return filter and the direct mouth to have a mud box.

A jet pump to be laid out to discharge bilge water in the chain locker.

The bilge water system to be equipped with an oil-water separator meeting the requirements of the *Rules and Regulations* with a capacity of 0.25 m^3/h. After separation of the dirty oil-water, the water with oil content of less than 15ppm to be discharged overboard

and the oil to be collected in the dirty oil tank. The dirty oil in the dirty oil tank to be transported ashore through a special-purpose dirty oil pump via shore connection of the main deck

The quantity and location of the ballast tanks to be determined during the ship design. The ballast pumping system to have multiple unit valve boxes for the transfer of the ballast water.

9.03.8 Internal fire system of the vessel

The firefighting water of the water fire-extinguishing system of the ship to be supplied by a main fire pump in the engine room and a bilge and ballast pump (concurrent use). The fire hydrants and extinguishers to be installed according to the *Rules and Regulations*. The pipe line of the firefighting system can be used concurrently for flushing the deck and anchor chains. The displacement of the main fire pump to meet the requirements of serving as standby of the cooling seawater pump of the main engine.

A fire hydrant to be emplaced at each boardside and matched with one international shore connection.

This ship to be equipped with one set of foam fire extinguisher (45L) of vessel and vehicle use type.

9.03.9 Discharging and drainage system

This system to include discharging, drainage, and treatment of sanitary sewage.

The discharging and drainage of all the basins, wash basins, bathrooms, laundries and galley to be concentrated in proper groups and treated according to relevant regulations by the marine bureau. In emergency case, it can be discharged overboard via storm valves.

Gutters to be located at the base of four walls in the wheelhouse.

Sewage treatment plant to be also included in this system, whose specifications to be configured according to the ship’s practical situations. The plant to treat the sanitary sewage of the ship, which is discharged to the water area after meeting effluent standard. In emergency case, the sanitary sewage can be discharged directly.

9.03.10 Air pipe, sounding pipe and filling pipe

The foam tank, oil-water tank, oily water tank, void compartment and all sea chests to be equipped with air pipes, whose cross-sectional area and height to be determined according to the *Rules and Regulations*.

The air pipes of the lubricating oil circulation tank, fuel oil tank and daily service oil

tank to extend to the decks and to have metalic flame screens and pipe caps at the top ends of air pipes of the oil tanks and chests.

The depth sounding of the water tank and oil tank use self-closing depth sounding valve, extending to the accessible place in the checker plate with protective shield mounted at its end. The filling inlets of the liquid tanks to be collectively arranged at both sides on the main deck. The specific location and installation to be determined during ship design according to the requirements of the *Rules and Regulations*.

9.03.11 Air conditioning system

The air conditioning system of this vessel to use Daikin-brand center air conditioner with water-cooled air conditioner installed one in each of the crew space, conference room, captain's room, chief engineer's room, officer's room and monitoring room. An independent ceiling suspended air conditioner to be installed in the wheelhouse. If the external temperature is 38℃ in summer, the indoor temperature to be controlled to 28℃ or below.

The air-conditioner to choose rectangular duct with stainless-steel spherical diffuser mounted at its end. An air-conditioned cooling sea water pump with brass shell, stainless steel shaft and bronze impeller to be installed. The starting device of the center air conditioner set to be interlocked with the air-conditioned cooling water pressure and the air conditioner cannot be started in case the pressure of the air-conditioning cooling water is too low.

9.03.12 Ventilating system

The engine room to be mechanically ventilated with two sets of reversible axial flow fan-ventilators mounted on the engine room casing. The configuration of the engine room ventilator to meet the requirements for heat dissipation of the engine room and for fresh air of the internal combustion engine. The ventilators to be allocated as required by the *Rules and Regulations* and to choose matching caps.

The crew space to be equipped with axial flow fan ventilators.

The mechanical ventilation system to have emergency cutoff device.

The storage battery room and storeroom to have fresh air inlet.

The bathroom, washroom and toilets to mount one exhaust fan in each.

9.03.13 Hydraulic oil system

The hydraulic oil system supplies hydraulic oil with a pressure of 200-240 bar, mainly used to drive the deck machinery. It consists of:

One main hydraulic pumping station connected to the right main engine via PTO, and

One auxiliary motor-driven hydraulic pump with electric starting box, whose power is 20% of that of the main hydraulic pumping station.

9.04 Tools and storeroom of the engine room

9.04.1 Tools

The engine room of this ship to be equipped with the following items: one fitter's bench, one 200mm bench vice, one electric drilling machine with max. drilling diameter of Φ13mm, one Φ150m desktop electric sanding machine, one main/aux. engine oil nozzle testbed , one tool rack and one set of daily service equipment.

Two pieces of engine tool shelves and one piece of note board.

Two equipment boxes in the control room.

9.04.2 Storeroom

This ship to be equipped with one storeroom for large-size tools and mechanical spares at the backside of the engine room, having internally racks and drawers with lockup device. The specific quantities and specifications to be determined during ship design.

Part 10 Monitoring and Alarm System

10.01 General

The local monitoring and alarm devices for the machinery and the monitoring and alarm devices in the engine monitoring room to be provided in accordance with Rule requirements.

Monitoring and alarm devices for important equipment to be supplied by the manufacturers according to requirements concerned.

Propulsion plant is required to be remotely controlled from wheelhouse console.

Alarms for all equipment to be centralized and indicated respectively in the monitoring rooms located in engine room and in the wheelhouse. (Items of alarms and indicators are as specified in 8.05 of the Specifications)

10.02 Wheelhouse console

Two wheelhouse consoles are to be separately arranged at port and starboard sides and at the fore part of the wheelhouse. A chair to be fit on slide rails between the two wheelhouse consoles. Following items to be installed in the wheelhouse consoles:

（1）Tachometer for main engine （2×）

（2）Push buttons for step-control of main engine revolution

（3）Emergency stop push button for main engine （2×）

（4）Generator running indicating light（2×）

（5）Light modulator knob/ switch

（6）Switches of various navigation equipment(referred to Part VII)

（7）Centralized alarm panel(referred to 10.01)

（8）Double- speed changeover switch for wheelhouse window wipers with interval wipe and water spray functions (depending on the functions of the products actually selected)

（9）General alarm switch with reset function

（10）Push button for cutting off fan and oil

（11）Sound powered telephone

（12）Remote control handle for search light

（13）Control modules for warping winches and windlass

（14）Control panel for external fire-fighting system

（15）Air horn push button

The purchased manoeuvring console for the propeller of the Voith to be equipped with following items:

（1）Steering wheel for the Voith propeller

（2）Double-handle controller for controlling propeller pitch

（3）Change-over handle for selecting working mode of the tug

（4）Light modulator

10.03 Alarm

Alarms and indicators to be included in the main engine alarm console and wheelhouse control console are to be as follows (only for reference, such alarms and indicators are to be finally confirmed when drawings submitted to approval after main engine, propeller, deck machinery etc. have been selected)

Items	Monitoring room		Wheelhouse console		Remarks
	Indica-tion	Alarm	Indica-tion	Alarm	
1. Alarms relevant to main engine					
Main engine emergency stop		√		Main engine stop	Automatic stop
Main engine stop due to low pressure of lubricating oil		√			
Main engine stop due to over-speed		√			
Sea water low pressure at inlet of main engine		√		Main engine abnormal alarm	Signals given by main engine
Fresh water low pressure at inlet of main engine		√			
Fresh water high temperature at outlet of main engine		√			
High level of main engine oil drain tank		√			
Low pressure of main engine lubricating oil		√			
High temperature of main engine lubricating oil		√			
High differential pressure of lubricating oil filter		√			
Low pressure of main engine fuel oil feed pump		√			
Low pressure of main engine supercharger lubricating oil		√			

Close of main engine air control valve		√			
High temperature of main engine air discharge		√			
Low pressure of controlling air		√		√	Signals given by main engine
Low pressure of starting air		√			
Main power source failure		√		√	
Failure of power supply of main engine alarm system（AC220）		√		Failure of main engine power supply	
Failure of power supply of main engine alarm system（DC24）		√			
2. Indication items relevant to main engine					
Indication of main engine control part	√		√		Signals given by main engine
Main engine tachometer	√		√		
Exhaust temperature of each cylinder	√				
Main engine running hour counter	√				
Control air pressure meter			√		

Items	Monitoring room		Wheelhouse console		Remarks
	Indica-tion	Alarm	Indica-tion	Alarm	
3. Alarms relevant to propeller					
Low pressure of propeller control oil		√		Propeller abnormal alarm	Signals given by propeller
Low pressure of propeller lubricating oil		√			
4. Alarms relevant to Voith propeller					
5 bearings' temperature	√	√			
Propeller lubricating oil temperature	√	√			
Hydraulic coupling temperature	√	√			
5.Generator set alarm items					Alarms to be set

High temperature of generator set lubricating oil		√		Generator set abnormal alarm	by generator set manufacturer
Low pressure of generator set lubricating oil		√			
High temperature of generator set cooling water		√			
Generator set over-speed stop		√			
6. Indication item for generator set					
Generator set running	√				
7. Other alarms of ship system					
Low level of fuel oil service tank		√		Other equipment abnormal alarm	Signals given by shipyard
Low level of main engine expansion tank		√			
bilge water high level		√			
High level of slop tank		√			
Low pressure of auxiliary starting air		√			
Low oil level of hydraulic windlass/winches		√			

Part 11 Electric equipment

11.01General

Design, construction, installation, test and commissioning (including electric wiring) of main electric equipment and relevant material are to be comply with the current effective *Rules and Regulations for the Construction and Classification of Sea Going Steel Ships of CCS, CB/T3909-1999 Technological Standard for Installation of Marine Electric Equipment* and Ship-owner's requirements simultaneously.

11.01.1 Protection degree of electric equipment

Protection degrees of electric equipment to satisfy following requirements:

（1） IP22 for those located in machinery spaces such as control rooms, Voith propeller room, engine room etc..

（2） IP44 for those located in galley etc.

（3） IP56 for those located on the weather deck.

11.01.2 Voltage and frequency of power supply and distribution system

Voltage, frequency and distribution for electric equipment to be as follows:

Items	Voltage	Frequency	Phase	System
Generator	AC400V	50Hz	3Φ	Three-wire insulation
Motor	AC380V	50Hz	3Φ	Three-wire insulation
Lighting	AC220V	50Hz	1Φ	Two-wire insulation
Nautical equipment, Radio equipment	AC220V DC24V	50Hz	1Φ	Three-wire insulation Two-wire insulation
Interior communication alarm	AC220V DC24V	50Hz	1Φ	Two-wire insulation
Emergency lighting	DC24V			Two-wire insulation

11.01.3 Name plate and label

Main electric equipment such as main switchboard, engine room alarm panel, wheel house control console, and control boxes each to be given a fixture type name plate

indicating the application or name of the equipment. The name plate is to be made of copper or flame retardant plastic material. There to be an identification label at both ends of each main electric cable indicating the same number as specified in electric system drawings.

11.01.4 Metal box casing of electric equipment are to be firm in construction and perfect in configuration.

11.01.5 There to be a red scale indicating the rating value for all instruments.

11.01.6 Main switches, feeder circuit breakers, electric elements on main switchboard, shore supply switch on the shore connection box are to be of Schneider products, and feeder circuit breakers of section boxes, wheelhouse control panel, charging and discharging panel etc, of Meilanrilan 梅兰日兰 products.

11.01.7 Spare parts of all electric equipment to be provided in accordance with the Rules.

11.02 Cables

All cables to comply with GB and CB Standards together with the Rules. Rating voltages and currents of electric cables are to comply with rated values of consumers or motors plus a margin.

Unless otherwise stated, electric cables to be of CEF92/SA,CEF82/SA. Cables for exterior lighting, navigation lights, signal lights to be of CEF92/SA. Cables for electric circuits of main engine and azimuthing Voith propeller, communication and nautical equipment and radio equipment, of shielded CEF82/SA、CEFP80/SA. Connection wires within distribution boxes and instrumentation boxes, to be of CBVR——type C marine polyvinyl chloride insulated. Conductor cross-section of control cables to be 1.0mm^2.

For portable appliances such as portable hand lamps etc., cables to be of flexible rubber insulated, polyvinyl chloride sheathed. Special cables such as coaxial cables, compensating cables to be as specified or approved by equipment manufacturers. Enough spare cables to be provided for running between important spaces such as wheelhouse, engine room, Voith propeller room.

In general, cables to be installed in bunch and on galvanized metal support bracket as far as practicable. Where the cables are exposed to any mechanical damage, they are to be protected by steel conduit, steel plate or flexible tube. For cables laid in bunch, space between support brackets to be not exceeded 250mm.

Penetration cables between engine room and Voith propeller room or engine room and crew's room to be provided with glands in accordance with the Rules. Cables passing through other decks, bulkheads are to be protected by steel tubes or steel coamings. Cables installed below the checkered steel plate in engine room or passing through weather deck are to run in a metal tube sealed at both ends with insulating packing. Internal surfaces and mouths of such tubes to be smooth. Corrosion prevention measures to be taken for the inside of tubes.

Cable runs are to be as far as practicable fixed in straight line, far away from heat sources. In case the latter is not avoided, effective isolation actions shall be taken. Cross runs are to be minimized.

All terminals of cable cores to be fitted with proper copper connectors

11.03 Generator

Two brushless, constant-voltage, three –phase, synchronizing generators are to be installed as follows：

Items	Main generator（Siemens）
No. of sets	2
Type	Natural circulation, drip-proof
Capacity	One set to satisfy the requirement for capacity
Rated voltage	AC 400V
Frequency	50 Hz
Phase	3 phase, three-wire insulated system
Power factor	≥0.8
Rated revolution	1500r／min
Exciting system	Brushless self-exciting
Rating	Continuous
Insulation	F

Two generator sets to have the function of shifting load from one to another, but continuously running in parallel not required. One spare part of AVR is to be provided.

11.04 Transformer

Two transformers, one to be acted as standby of another, are to be installed in engine room. Characteristics of the transformers are to be as follows:

Type	CSGD
No. of sets	2
Model	Dry type
Enclosure	Drip-proof
Capacity	One transformer to be able to meet the need of consumers under any load condition
Voltage	Primary 3Φ AC 400V Secondary 3Φ AC 230V
Frequency	50 Hz
Insulation	Class B

11.05 Storage batteries and charging devices

11.05.1 Storage batteries

The batteries for general service to supply the power for interior communication and alarm equipment, emergency lighting.

Two sets of batteries are to be installed in the storage battery room on the main deck in which good ventilation condition to be provided.

Each storage battery is to be of maintenance free, voltage 12V, capacity 195 Ah. The capacity of each storage battery group is to be in accordance with the Rule's requirements.

Battery boxes to be made of glass-reinforced plastic material.

11.05.2 Storage batteries for radio equipment

Storage batteries to act as standby power supply for radio equipment. Two groups of storage batteries, one to be in service and another,on standby, are to be set on upper deck.

Each storage battery is to be of maintenance free, voltage 12V, capacity 195 Ah.

Battery boxes to be made of glass-reinforced plastic material.

11.05.3 Emergency charging and discharging board

This ship is to be equipped with one set of charging and discharging board in accordance with the Rules. It is to be used for charging the emergency batteries and for supplying power through a distribution switch to the control systems of engines and propeller, DC24V power source for aids to navigation and interior communication equipment, and also through fuses to emergency lighting on board the ship.

11.05.4 Charging and discharging board for radio equipment

This ship is to be equipped with one set of charging and discharging board dedicated to the storage battery for radio equipment and supplying power to them.

11.06 Electric distribution and monitoring equipment

The electric distribution apparatus and domestic purchased control boxes on board the ship are to be of Saier from Zhengjiang or Siyang 赛尔或四洋 products. Main switches to be of

Schneider products. Branch switches are to be of Meilanrilan products.

11.06.1 Main switchboard

There to be one main switchboard arranged in monitoring room of engine room.

Characteristics of the main switchboard: dead front, self-standing and frame work structure secured to the channel bar base by bolts; bolted type link between panels; three (3) phase, three (3) wire system.; Connection and maintenance to be operated in front of the switchboard panels.

The main switchboard to consist of four (4) panels including two (2) generator panels, one (1) feeder panel and one (1) group starting panel. It is to function of monitoring running condition of whole generating station, controlling revolution of the prime mover, and conducting manual or coarse synchronizing. The generator panel is to be fitted with following meters: power meter, voltage meter, current meter and insulation level monitor etc.. The main switch gear is to be operated in manual or electric control mode and to have longtime delay, short time delay, short circuit snap action, under-voltage delay protection functions. Reverse power protection is to be set for the generator panel. There to be equipped with proper circuit-breakers, relays, indicators and other necessary apparatus all of which are of famous brands. The important parts within the switchboard are to be added individual name plates indicating their functions. There to be electric interlock between generators and shore power supply and one watt-hour meter for shore power supply to be set. Speed governor for generators and potentiometer for regulating voltage are to be installed on the main switchboard.

11.06.2 Centralized control console in wheelhouse

There to be one set of centralized control console in wheelhouse which to be equipped with following apparatus: distribution boxes for navigation lights, signal lights, working lights and exterior lighting; control box of public address system, control box of air horn, AC220V/DC24V distribution box for aids to navigation, fire alarm and general alarm boxes, sound powered telephones, fan and oil cut-off push buttons etc.. Distribution boxes for navigation lights and signal lights, control boxes for public addressor system and fog horn and fire alarm box are to be of panel mounted type.

11.06.3 Distribution boxes

Distribution boxes on board the ship to be of type PD and made of steel material. The quantity of distribution boxes is to be as designed. There to be at least two spare switches kept in each distribution box.

11.06.4 Shore connection box

One set of AC380V, three (3) phase, 60A, 50Hz, water-proof type shore connection box to be provided for shore supply when the ship put in harbor. The box is to be equipped with an air circuit breaker, a phase sequence indicating lamp, a manual/automatic phase sequence change-over switch, and to have over load protection and phase-failure protection functions. One shore connection cable of 100m in length, with core of 3*25mm^2 and one shore connection cable drum to be also provided.

11.06.5 Control device for fire-fighting system

One set of control device for external fire-fighting system to be provided in wheelhouse.

11.07 Power equipment

11.07.1 Motors

Unless otherwise noted, particulars of motors are to be as follows:

Type：	Y-H，air cooling，squirrel cage induction		
Voltage：	AC380V	Frequency：	50Hz
Phase：	3 ϕ	Insulation class：	B

Running mode：continuous duty system

11.07.2 Magnetic starters

All motors with rated power more than 0.5kW to be equipped with magnetic starters, those with rated power equal or greater than 7.5kW to be started in star-delta mode. The remote control push buttons to be arranged in the vicinity of the motors they controlled.

Motors with rated power more than 10kW, start boxes (excluding group start panels) to be fitted with ammeters.

All starters expect those to be used for small power motors are to be of magnetic type with over load protection, short circuit protection and no-voltage protection functions.

Starters for the motors of air compressors, fresh water pumps and fuel oil feed pumps to be provided with an automatic/manual control change-over switch respectively, others to be of manual control type.

11.08 Lighting system

11.08.1 Lighting fixtures and outlets

All lighting fixtures to satisfy the illumination level where they are located. Lighting fixtures located in important spaces such as engine room, Voith propeller room etc. to be fed through two independent power sources from a lighting distribution box. DC24V lighting fixtures to serve under emergency condition and to be automatically fed from DC24V emergency power source in case of failure of AC220V power source from the main switchboard. If such case is occurred, audible and visual alarm will be given. Emergency lights to be separately arranged in importance spaces such as engine room, ruddre-propeller room and passage way etc.. All switches are to be of double-pole type, all sockets and outlets, of three-pole type, one of them to be of earth connection pole. Lights arranged outside the passageways to be controlled from the wheelhouse or inside passageways.

Fixing screws for the lighting fixtures exposed to wet & moistures or weather are to be made of stainless steel material.

Lighting fixtures and outlets to be arranged as follows:

1) Fluorescent type ceiling fixture light with guarded globe to be provided in wheelhouse, captain's room, chief engineer's room, crew's cabins, conference rooms, monitoring room and inside passageways;
2) Chart table light with dimmer switch to be provided for chart table in wheelhouse;
3) Type CCD9-6, watertight, ceiling fixture light made of stainless steel or copper material to be provided on decks where it is exposed to weather.
4) Water-proof lights with good appearance to be provided in galley and lavatories.
5) Fluorescent type drip-proof and screen protected ceiling fixture light to be provided in engine room and Voith propeller room; two 400 watts lights to be provided in engine room casing.
6) One desk light to be provided at each desk in monitoring room of engine room, captain's room, chief engineer's room and crew's cabins.
7) Fluorescent type berth light at the head of each berth to be provided.
8) Eight (8) DC（AC）24V/60W watertight portable type with 20m long flexible cord and watertight plugs to be provided.
9) 15 watts emergency lights to be provided in engine room, in passageways within wheelhouse area etc.
10) A number of sockets are to be provided in passageways, cabins, galley and mess room. The quantity is to be determined during ship design and confirmed by the Buyer when

drawings submitted to approve.

11）Type 36V and 24V sockets, four (4) for each to be provided in engine room, Voith propeller room and monitoring room.

12）Explosion-proof type lights to be provided in paint store and storage battery room.

Part 12 Annex

Annex 1: Import equipments list supplied by ship owners

Item No.	Description	Quantity
1	Main engine	2 sets
2	Propulsion system	2 sets
3	Windlass with warping drum	2 sets
4	Warping winch	1 set
5	Marine central air conditioner	1 set
6	External firefighting device	1 set

Annex 2: List of daily necessities

Item No.	Description	Quantity
1	Bed sheet	24 sheets
2	Sponge-padded mattress (with fine canvas cover)	12 sheets
3	Towelling coverlet	12 sheets
4	Quilt cover	24 sheets
5	Woollen blanket	12 sheets
6	Pillow	18 pieces
7	Pillowcase	24 pieces
8	Mat(same width with the bed)	12 sheets
9	Pillow towel	24 pieces
10	Pillow mat	18 pieces
11	kitchenware, dishware	16 sets
12	Quilt (2-2.5 Kg)	18 sheets
13	bowl, chopsticks, cup, thermos and etc.	16 sets

Annex 3: Tool list for hull

Item No.	Description	Quantity
1	Sounding stick for oil and water	2 for each
2	Mallet	1
3	Octagonal hammer	1
4	Fitter's hammer（0.5、1.5Kg）	1
5	Spanner for manhole cover	4
6	Wrench for bottom floor	2
7	Stencil pen (big & small)	12 for each
8	Fid (big & small)	12 for each
9	Besom (thick & fine), mop	10 for each
10	Brush for floors	10
11	Dustpan	6
12	Garbage can	6
13	Water bucket	5
14	Φ25mm×1000mm Crow bar	2
15	Grease gun(grease nipple 20 pieces, grease 5Kg)	4
16	5m、20m Band Tape	2 for each
17	Cable hook	2
18	Hook for marine use	1
19	Stand for hand steel saw (with 20 saw blades)	2
20	Tinner's scissors, canvas scissors	1 for each
21	Jack knife	2
22	Sharpening stone	2
23	8" 10" 12" Adjustable spanner	2 for each
24	6" 8" Cross screw driver	2 for each
25	6" 8" Plane screw driver	2 for each
26	Double offset ring spanner	1 set
27	Flashlight (water-proof, with 2 boxes of battery)	2
28	6" 8" Steel pliers	2 for each
29	50m messenger line	2
30	Waxed flag Rope	100m
31	Tool box	1
32	Plain glass spectacles	5 pairs
33	Carpenter's saw, plate saw, wooden ruler	1 for each
34	Plane (thick, fine)	1 for each
35	Carpenter's axe	1
36	Carpenter's file	2
37	Twist gimlet (with 2 bits)	1
38	Padlock	15

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39	Canvas needle	1
40	Thimble	1
41	Canvas gloves, cotton gloves	20 pairs each
42	（16、20）Coir rope	100m for each
43	Steel Wire（10#、12#、16#）	20Kg for each
44	Wire clamp	10 for each
45	Shackle (specifications that used)	20 for each
46	Rigging screw (specifications that used)	4 for each
47	Chain (all specifications)	50m for each
48	Portable herringbone aluminum ladder (2m)	1
49	Portable battery safety light	2
50	First aid box	1
51	Line-throwing apparatus	1
52	High-power submerged pump	1
53	Wastes	100Kg
54	Paint scrapper	10
55	Long-handle de-rust scrapper	10
56	2”、3”、4”Flat paint brush	10 for each
57	1”、2”、3”Bending handle brush	10 for each
58	Roller brush	10 for each
59	Hammer for removing the rust	10
60	Wire brush	10
61	Electric inclined grinding machine (100mm, AC 220V)	2
62	De-rusting shovel	10
63	Paint drum(big, small)	5 for each
64	White paint, deck finishing paint	40Kg for each
65	Black paint, fluorescent paint	20Kg for each
66	Rust-resistant paint	20Kg for each
67	Grinding wheel blades	50
68	Wire brush blades	50
69	Electro-calculator	2
70	Stapler	2
71	Staples, clips, pins	2 for each
72	Inkpad	2
73	Whiteboard (big & small, with felt-tip pen & eraser)	4
74	Manual sharpener	2
75	Pencil	10
76	Eraser	5
77	Ball pen, signing pen (red, black)	10 for each
78	Marking pen	5 for each
79	Carbon paper	2 pieces
80	Ruler	2

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Annex 4: Tools list for marine machineries

Item No.	Description	Specification	Quantity
1	Vernier caliper	150mm、300mm	1 for each
2	Depth vernier caliper	300mm	1
3	Platform	Cast iron, about 600mm×600mm	1
4	Micrometer with holder	（measuring scope 0-10mm，graduation value 0.01mm）	1
5	Inside caliper	300mm in total	1
6	Outside caliper	300mm in total	1
7	Inside micrometer	(25-50mm 50-75mm)	1 for each
8	Outside micrometer	(100-160mm 160-250mm)	1 for each
9	Dial-indicator (with magnetic holder)	(max measuring height 250mm)	1
10	Feeler gauge（0.03-0.5）	(0.03-0.5mm)	4
11	Feeler gauge	(length 100mm,17 pieces)	1
12	Screw gauge	(conventional, UK)	1 for each
13	Hand tachometer	1000rpm	1
14	Marking compasses (steel)	Length 250×350mm	1
15	Steel ruler	Length 1000mm	1
16	Sounding rod	2m	1
17	Steel tape, band tape	3m、30m	1 for each
18	Calculator		2
19	Semiconductor temperature gauge		1
20	Fine file with handle	Length 300mm，circle & hemicircle, flat	1 for each
21	Moderate file with handle	Length 300mm，circle & hemicircle, flat	1 for each
22	Coarse file with handle	Length 300mm，circle & hemicircle, flat	1 for each
23	Fine file with handle (double tooth)	Length 300mm，circle & hemicircle, flat	1 for each
24	Finishing file	（12 pieces/set 160/175mm）	1 set
25	File brush	Length 220mm	2

Item No.	Description	Specification	Quantity
26	Box spanner (with ratchet spanner, planing head handle, rocking handle, long & short extension rod, etc)	10-32mm，17 pieces in total with box	1 set
27	Double offset ring wrench	8-32mm，7 pieces	1 set
28	Double offset ring wrench	12、14、30、32	2 for each
29	Double end spanner	10 pieces	1 set
30	Double end spanner	17*19，24*27，30*32，32*36	2 for each
31	Dual purpose spanner	10 pieces	1 set
32	Adjustable spanner	100、150、200、300、375、450mm	2 for each
33	Inner hexagonal spanner	16 pieces/set	1 set
34	Hammer	（weight 0.45Kg、0.9Kg with handle）	1 for each
35	Copper hand hammer	（weight 0. 5Kg、1.0Kg with handle）	1 for each
36	Wooden hammer	（with handle）	2
37	Flat hammer		1
38	Copper hammer	（φ50mmX300mm with handle）	2
39	Steel pliers		2
40	Slip-joint pliers	200mm	2
41	Long-nosed pliers	200mm	2
42	Retainer ring pliers for hole	125、175； straight、angled	1 for each
43	Retainer ring pliers for shaft	125、175； straight、angled	1 for each
44	Pipe pliers	250、350、450	1 for each
45	Pipe cutter	Between 20mm	1 set
46	Pipe threading die and handle		1 set
47	thread die (round)	All specifications that needed	1 set
48	Tap	All specifications that needed	1 set
49	Tube expander		1

50	Triangle scraper	Large & small with handle	1 for each
51	Flat scraper		
52	Flat chisel	16-175mm	2
53	Oil groove chisel	large-size 150mm	2
54	Hand hydraulic pipe bending machine	largest-size	1
55	Hand hydraulic jack	2T	1
56	Hand chain block (gear-driven)	1、1.5T	2 for each
57	Screw driver（一 Type）	φ6×100mm, φ4.5×50mm	4 for each
58	Screw driver（十 Type）	100,200mm	4 for each
59	Three-claw clamp	6”、10”	1 for each
60	Clamp with long bolt	Large & small	1 for each
61	Pneumatic paint spray gun		1
62	Belt punch	3-21mm	2 for each
63	Center punch	(L=125mm)	1
64	Portable drilling machine	φ13mm(with 3-13mm drills)	1
65	High-power searchlight	chargeable	2
66	24V Working light	（with cables）	2 sets
67	Scissor for packing		1
68	Tinner’s Scissor		2
69	Packing tool		1 set
70	Handing saw (adjustable)	With 300-long saw blades, 12 pieces l=300mm	1 set
71	Oil tray	1000×400×200	2
72	Grease gun (unbend, angled)		1 for each
73	Handles for opening the valves	All specifications	4 in total
74	Tools for opening plug on the deck		2
75	Drum	iron，10L	4
76	Drum	plastic，10L	2
77	Oil measuring gauge (big, small)		1 for each

78	Oil can (mouse type)		1
79	Oil can (hopper type)		1
80	Steel crow bar	φ30×1000mm, φ15×500mm	2 for each
81	Listening rod		1
82	Tool box		1
83	Steel pulley block	(with 45m hemp ropes)	2
84	Steel cable	φ4，φ12	1 for each
85	Shackle	Big & small	10 for each
86	Nylon brush		10
87	Thread glove		50
88	Rags, wastes		50Kg for each
89	Besom, mop		5 for each
90	Fishpaper	Thickness 0.5、1、1.5mm	5 for each
91	Cotton-padded mat	All specifications that needed	3 coils each
92	Oil-resistant rubber	All specifications that needed	5 coils each
93	Metal pail with cover		1 for each
94	Steel wire (fine)	φ=1mm	1Kg
95	Oil stone		4
96	Abrasive paste	Thick & fine	5 boxes each
97	Abrasive cloth	Thick & fine	10 for each
98	Rust remover		2 bottles
99	A、B glue		2 sets
100	502 glue		6
101	Epoxide resin	10Kg	1 bucket
102	Lithium grease	20Kg	1 bucket
103	Eye bolts	M10、12、14、16、20	4 for each
104	Bolts and nuts	M10、12、14、16、20	100 for each
105	Double end bolts and nuts	M10、12、14、16、20	100 for each
106	Washer	10、12、14、16、20	100 for each

107	Cotter pin	All specifications	20 for each
108	Copper bar		
109	Nylon bar		
110	Steel wire rope	φ4，φ12, 5m for each	2 for each
111	Copper connector	Specifications that needed	10 for each
112	Stainless connector	Specifications that needed	5 for each
113	Copper pipe		3m for each
114	Copper lock		20
115	Pipe holder	（25、32、40、50、75mm）	20 for each
116	Fuel hose	with pipe joint and hopper-type stuffing device	1 set
117	Fuel hose	（plastic， φ40mm*30m， with metal filament）	1
118	Lube oil hose	（plastic，φ50mm*30, with metal filament）	1
119	High pressure air rubber tube		30m
120	Pivoted manual oil pump	Portable	1
121	Electric de-fueling pump		1
122	Submerged pump	With hoses long enough	1 set
123	Compressed air rubber tube		20m
124	Electric valve grinding machine		1 set
125	Type 6135 diesel engine valve seat reamer		1 set
126	Axial-flow fan SF3-4		2 sets （mini-type）
127	Small portable welding machine		1 set
128	0.5t Chain block		1
129	1t Chain block		2
130	5t、10t Hydraulic jack		1 for each
131	Digital multimeter		1
132	Inserting amperemeter		1

Annex 5: Supplies list of hull

Item No.	Description	Quantity
1	Telescope 7×50mm	2(one is night version)
2	Magnifier	2
3	Protractor	1
4	Positioning instrument with three pole	1
5	Dividers	1
6	Triangular ruler 360mm	1 set
7	Parallel rulers	2
8	Proportional scale	2
9	Clinometers (pendulum type)	2
10	Chart weight	4
11	Stopwatch	2
12	Chronometer	1
13	Sextant	2
14	Ship's bell with diameter 300mm	3
15	Sounding lead（3.2Kg,46m）	1 set
16	Marine clock battery	According to the quantities of cabins
17	International signal flag book	1
18	Black ball φ600	2
19	Diamond 600	1
20	National flag (No.4)	2
21	National flag (No.5)	2
22	International signal flag	1 set
23	Signal flag	1 set
24	Marine parachute distress signal in red	12
25	Marine pyrotechnic signal in red	12
26	Marine smoke signal in orange	2
27	Chart (coast chart from shipyard to Shenzhen Mawan port)	1 set

Annex 6: Tools list for marine machineries

Item No.	Description	Spare parts configuration
1	Main engine	Spare parts specifications and quantities for offshore area required by CCS
2	Propulsion	Spare parts specifications and quantities for offshore area required by CCS
3	Deck machinery	According to CCS requirements and manufacturer's standards
4	Diesel-driven alternator	According to CCS requirements and manufacturer's standards
5	External firefighting device	According to CCS requirements and manufacturer's standards
6	Air conditioner unit	According to manufacturer's standards
7	Others	According to CCS requirements and manufacturer's standards

Annex 7: Electrical spare parts and tools list

	Item	Specification	Quantity	Remarks
1	Main switchboard			
	Main switch	Same type	1	
	Branch switch	Same type		1 for each 6
	Indicating light	Red/yellow/green/white	2 for each	
	Indicating bulb		10	
	Fuse	All types	10 for each	
	Instrument changeover switch	All types	1 for each	
2	Spare parts for shore power box			
	Air breaker		1	
	Indicating bulb		4	
	Condenser		1	
3	Spare parts for starting box			
	Electromagnetic contactor		1 for each	
	Fuse		2 for each	
	Indicating light		5 for each	
	Indicating bulb		2 for each	
	Heat relay		1 for each	
4	Spare parts for illumination system			
	Switch	All types	2 for each	
	Heliolamp	All types	20 for each	
	Starter		50	
	Bulb	All specifications	5 for each	
	Plug, socket	All specifications	2 for each	
	Incandescent bulb	All specifications	2 for each	
5	Spare parts for navigation and signal lamps			
	Navigation lamp holder		2	
	Lampshade	All types	1 for each	
	Navigation bulb	60W	20	
	Casing		5	
	Switch		5	

6	Measuring instrument			
1	Digital multimeter		1	
2	Megohmmeter		1	
3	Portable digital tachometer		1	
4	Inserting amperemeter		1	
5	Steel tape		1	
6	Stainless ruler		1	
7	Test pencil		3	
8	Dry-type thermometer		2	
7	Others			
1	80 pieces combination tools		1 set	
2	Hand drilling machine	10mm	1	
3	Drilling bit		1 set	
4	Water-proof flashlight		1	
5	Portable blower		1	
6	Pliers		1	
7	Long-nosed pliers		1	
8	Flat-nosed pliers		1	
9	Electrician's cutter		2	
10	Steel hammer		1	
11	Wooded hammer		1	
12	Adjustable spanner	110×14mm 150×19mm 200×24mm 250×30mm	1 for each	
13	Cross screwdriver	100mm 150mm 200mm 250mm	1 for each	
14	Plain screwdriver	100mm 150mm 200mm 250mm	1 for each	
15	Files of all kinds		1 set	
16	Electric soldering iron		2	
17	Hacksaw		1	With 2 boxes of blades
18	Insulating gloves		1 pair	
19	Scissors		2	
20	Stainless steel forceps		2	
21	Soldering compound		1 box	
22	Solder alloy		1 kg	

23	Polyvinyl chloride (PVC) insulation strap		4 coil	
24	Cold-pressed connecting pliers	400mm	1	