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BUILDER		HULL No.	
OWNER	.	CLASS	ABS
TITLE	2000/3000T DERRICK PIPELAY BARGE		DETAIL DESIGN

DESIGNED		TECHNCIAL SPECIFICATION	DWG.	JH958-100-03SM		Rev.
CHECKED						
VERIFIED			SCALE	WEIGHT	PAGE	DATE
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BESTWAY

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1 GENERAL

The vessel is to be designed as a non self-propelled shallow water pipelaying barge equipped, and capable of laying submarine line in 300mdepth water. Operating line for pipelaying is to be situated on starboard side of main deck, store area for pipeline is to be situated on port side of main deck, stern to be provided with fixed type stinger.

Main deck is capable of store abt. 5000t pipes. The loading, unloading and transfer of pipes is to be carried out by one (1) pipe crane, roller and transport unit.

One (1) 3000t (fixed type)/2000t (full revolving type) marine heavy crane is to be fitted on stern.

Cabins is to be capble of accommodating 310 persons operating onboard.

The operational area will be China and other world shallow waters.

It is the intent of this specification to describe definitely the design and technical requirement of a non self-propelled shallow water pipelaying barge (hereinafter called the barge), satisfying the requirement of construction, assembly, test and delivery.

If any inconsistencies are found among the contents of the specification, the explanation from Builder will prevail.

2 GENERAL

2.1 Definition Description

2.1.1 Definition

The following items mentioned in the Specification, denifition to be as follows:

Vessel： Non self-propelled pipelaying barge

Builder：

Designer： Shanghai Bestway Marine Engineering Design Co., Ltd.

Classification Society： ABS

Suppliers： Companies and agencies related to construction and outfitting of the barge, they manufacture or supply material, equipemtn and service.

2.1.2 Character、definition、density and unit

The drawing, operating instruction, instrument, display etc to be written by Chinese or English. Caution plate and nameplate to be written by Chinese/English. Foreign language plate to be retained for imported machinery and equipment which also to be equipped with international nameplate.

Unless otherwise specified, the design and construction of hull, crane and electromechanical equipment etc is to apply legal unit of measurement.

2.2 General Description

2.2.1 Main dimension

Length overall, Loa：	abt. 169 m
Breadth molded, B：	46.00 m
Depth molded, D：	13.50 m
Operating draft：	7.00-9.00 m
Scantling draft：	9.00 m
Gross Tonnage：	41375 t

2.2.2 Purpose

The vessel is to be a non self-propelled barge capable of laying pipeline in max. water depth 300m .

The another important function of the barge is to be capable of carrying out lifting operation of marine engineering. Full revolving heavy duty crane with 2000t lifting capacity (the lifting capacity to be 3000t under stern fixed mode) to be mounted on the cradle feet located on longitudinal center line of stern.

2.2.3 General arrangement

Continous main deck is to be arranged on 13.5m height above base line. The

cradle feet of crane to be installed on aft part of main deck. Pipelay working line to be arranged on the starboard side of maindeck, set with welding equipment, NDT equipment, coating equipment and other assistant equipments, such as transverse with trolley pipe loading and unloading equipment and pipe cutting groove equipment etc. A&R winch to be arranged on fore part of maindeck.

A,B,C,D,E,F decks six-storeyed surperstructure to be arranged on bow maindeck, for service, crew life and central control room respectively.

The HELI Deck to be arranged above fore part of deck house.

Under maindeck, two longitudinal bulkheads, forepeak bulkhead and 7 transverse bulkheads separate hull into several watertight compartments.

2.2.4 Work Equipment

The pipelay system including pipe transport, storage, inner transmit equipment, auto welding equipment, repair equipment, aligner, tightener and A&R winch and fixed stinger.

Marine engineering heavy duty crane to be arranged on the aft, the full revolving elevating capacity of the crane is 2000t, fixed elevating capacity is 3000t, driving means is electric drive.

2.3 Builder work range

2.3.1 Certificates

Builder shall build the ship according to the specification or drawings, and the design, calculation and workmanship shall be approved by Classification Society. The certificates shall be got including following but not limited to:

Classification Society certificate or statement:

1. Interim Classification Certificate
2. International Tonnage Certificate
3. International Load Line Certificate
4. International Oil Pollution Prevention Certificate
5. International Sewage Pollution Prevention Certificate
6. Statement of Fact for Prevention of Pollution by Garbage
7. International Air Pollution Prevention Certificate
8. Register of Lifting Appliance
9. Ship Elevator Certificate
10. Statement of Fact for Safety Equipment

11. Statement of Fact for Safety Radio
12. Statement of Fact for Helideck
13. Statement of Compliance for Anti-fouling System
14. Record of Anti-fouling System
15. International Ship De-ratting Exemption Certificate

Other certificate and document according to the requirement:

1. Ship Builder's Certificate, Quality Guaranty

   (the builder don't provide mortgage announcement when delivery)
2. Ship Acceptance Protocol
3. Lifting Appliance Certificate, including lifting test report and lifting curve graph (contain lifting capacity table)
4. Noise, Vibration Test Report
5. Drinking Water eligibility Certificate

2.3.2 Material, workmanship and standard

2. 3. 2. 1 Equipments and material

The hull structure material, material of machinery and equipment all shall satisfy the requirement of American Bureau of Shipping, and provide the certificates according to the requirement of ABS.

It can use the equal material, equipment and component as substitution if approved by ABS and designer.

All material used in the vessel building shall be approved by surveyor, classification society or the other competent authorities.

2. 3. 2. 2 Workmanship

All adopted workmanship for the ship building shall be carried out according with CSQC Chinese Shipbuilding Quilty Standard and builder shipbuilding technological standards that is advanced, excellent and according with ISO quality management system. Quality requirement that is not concerned in all quality standard can adopted received, high quality standard.

Builder shall compile the building workmanship manual according to the shipyard shipbuilding standard and tradition. Important workmanship procedure shall be approved by ABS surveyor.

Apparatus, measuring indicator, instrument shall be calibrated using metric international units of measurement before commited.

2.3.3 Inspect, test and trial

Builder shall lay a inspection and performance test plan for all the equipments and system components.

Inspection and test of system components shall be carried out in manufacturer shop, Inspection and test of system components shall be carried out after installation.

Inspection plan shall indicate all equipments,systems needed inspection and inspection menthod adopted: workmanship inspection, and sea trial.

Performance test shall keep in line with currently available enactment, standard, specification and rule, and be approved by Classification Society.

Test shall be performed in the presence of Classification Society's surveyor and appropriate authorities's represent.

All works including performance test of all systems shall be approved by Classification Society's surveyor and appropriate authorities's inspector.

2.3.4 Spare and tool

Builder shall provide following spares and tools：

1. spares required by authorities concerned and ABS
2. spares and tool bought by builder used for start up and trail
3. standard spares and tool provided by manufacturer and contractor
4. special tools used for installing, operating and maintenancing all the other equipments

Spare, general purpose tools of the vessel's machinery, electric equipment shall be equipped according to production manufactory's provide standard and relate rule of Classification Society.

2.4 Design conditions

2.4.1 Work mode

The ship to be design for the following operating conditions：

1. single joint pipeline laying work
2. heavy duty lifting work

2.4.2 Operational area

The operational area of this barge to be shallow sea area. Max. pipelaying water depth to be 300m (12 inch pipe)

2.4.3 Environmental condition

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Operational mode for pipelaying：

The barge is capable of operating on the following environmental condition:

Wind speed	Vw = 16 m/s
Significant wave height	Hs = 2.5 m

Wave period (peak)	Tp = 6.0-12.0 s
Current speed	Vc = 1.5 kn
Spectrum type	Jonswap
Heading	0° - 360°

Lifting mode：

Restricting the movement and acceleration is to determine the max. environmental condition of lifting operation.

2.4.4 Design temperature and humidity

The following temperature condition to be considered during design:

Max.ambient temperature： +45°C @ 90% relative humidity

Min.ambient temperature： -10°C

Max. sea water temperature： +32°C

Min. sea water temperature： -2°C

The interior temperature for all air-conditioned space except E/R to be +25°C.

Gally, laundy /drying room, changing room, store room, bathroom, central control room, electricity control room and fire control room & other control space is not be guranteed with 25 °C

The HAVC system of accommodation quarter is to be designed based on following condition:

Summer condition

Ambient temperature	+40°C @ 70%RH
Temperature maintaining	+25±1°C @ 50%RH

Winter condition

Ambient temperature	-20°C @ 30%RH
Temperature maintaining	+20±1°C @ 30-40%RH
Fresh air supply not less than	28.8 m^3/h

2.4.5 Noise limitation

Designer shall design according to resolution of IMO A.468 Ⅻ《Ship Noise Level》,

2.4.6 Vibration

The ship vibration shall be according to ISO/6954 commercial ship vibration appraise guide book.

2.4.7 Capacity

Stock of consumables(not including pipeline stock) shall keep 60 days self

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maintaining operation (Vegetable self maintain is 30 days)

It can store 5000 tons pipes and other pipelay consumables at least on maindeck.

2.5 Class, rule, standard, code

2.5.1 Class

All engineering, drawings and specification are in accordance with the actual newest edition rules, standards and codes as mentioned in this chapter. The ship, including her machinery, equipment and outfitting are constructed under the supervision of American Bureau of Shipping to obtain a class notation, including:

✠A1 CRC DERRICK / PIPELAY BARGE

All pipelay equipments including stinger and stinger operate system shall be designed according applicable rules,standard and codes, but don't need to approved by Classification Society.

2.5.2 Rules and Regulations

The ship shall be design according to the following rule and requirement of regulation:

1. ABS《Rules for Classification and Building of Steel Barges》
2. 《Chinese Shipbuilding Quildy Standard》2006 edition
3. International Convention on tonnage Measurements 1967/1969 including amendments
4. International Convention of the Prevention of Collisions at Sea 1972, including amendments
5. International Convention for the Safety of Life at Sea (SOLAS), 1974 with Protocol of 1978 and related amendments
6. International Convention for the Prevention of Pollution from Ships (MARPOL) 1973 and Protocol 1978 (Annex I, II, IV, V and VI) and related amendments
7. IMO Code on Noise Levels on board ships, A 468 – XII
8. IMO A.749 Code of Intact Stability
9. International Electronical Commission (I.E.C.) Recommendation regarding electric equipment.
10. International Tele-Communications Radio Regulations 1973/1976 and 1982 including GMDSS-Telecommunication Regulations
11. Marine towage guide
12. ISPS rule
13. CB and GB

2.5.3 Flag

Hong Kong

2.5.4 Registration

Builder conduct the registration procedure. Minimize deadweight ton and gross ton of registered tonnage, inlcluding deduct permanent ballasting tank.

2.6 Drawing and photo

2.6.1 Drawings for Approval

Design finished by designer shall be approved by ABS.

Designer shall be charge of submitting the drawing ,document to Classification Society for approval, contacting with them about returning drawings for approval and document, solving and answering the return opinion of Classification Society, until Classification Society complete drawings approval.

2.6.2 Finished plan

When the ship is completed, builder's all drawings shall have the proper mark and be sotred and archived according to the requirement. The range of provided finished drawings shall be arranged by designer and builder. Finished drawings, dates, documents provided by builder shall be in accordance with requirement of ABS, influenced ship leave part attest among them shall be submitted in advance.

Inclining test report shall be included in trim and stability booklet, and approved by ABS or the other statutory survey department, two copies shall be handed to the ship for use on board.

2.7 Nameplate

All machinery equipment electrical equipment and valve shall fit name plate (builder shall maintain the intrinsic name plate if it is bought),. Every room door on board shall fit name plate(Chinese or English editions).

All equipment and main pieces shall fit identification name plate, to indicate manufacturer's name or brand, type and type grade etc. All identification name plate shall be pressing, forging or graven.

2.8 Launching

Builder take charge of ship's launching favorably, to ensure there is no inappropriate stress and local overloading when the ship launching, provide launching calculation report when necessary.

2.9 Inspection, survey, test and trail

2.9.1 General

Before the ship delivery, builder shall satisfy the requirement of Classification Society and the other statutory survey department via test.

Builder shall get all the data and written datum from manufacturer before installation.

Builder shall provide the following test result for the record:

1. Test report of manufacturer's all engines and machinery before installation

2. Result report of dock test
3. Result report of sea trail

The Builder shall prepare a set of general test and trail procedure one month before test and trail preparation and submit to ABS for approval.

The builder shall prepare a equipment's test and debug manual, in possible condition, machinery and equipment test shall be done according to related rule and produce literature.

2.9.2 Shop trial

Shop test shall be carrided out according to the rule of ABS and test outline. Notify builder and designer to attent manufactory shop test of main equipement ,such as diesel generating set, boiler, anchor winch, winch, main switchboard, lifeboat and lifeboat davit, control and monitor console etc. in advance.

2.9.3 Dock test

All works exposited in specification, including the ship's major structure, diesel generator set, piping, electric, auto control, ventilation and other systems, need to be proved that their workmanship and equipment performance during fabricationg process satisfy requirement of ABS Classification Society and other requirement refered in specification via test during dock test.

During dock test , when the ship is basically completed, do the inclining test to measure lightship weight and position of center of gravity at the draught condition that as low as possible according to the rule.

The builder shall organise and carry out the inclining test of the ship according to CB/T3035-1996 "Ship Inlcinning Test" after debug of the whole ship's equipments before crane lifting test, and provide the inclining test report. Test report shall be approved by ABS,and submitted to design organization.

2.9.4 Mooring trial

The mooring trail outline of the ship shall refer to GB/T3471 - 1995 "General provision for programming mooring and sea trails of sea going ship", test shall be performed in the presence of owner and ABS surveyor, test report provided by builder shall be signed by ABS surveyor.

2.9.5 Dock test and Sea trial

Unless standardization trail of classification and flag state, test program shall include but not limit to the following test:

1. Sailing mooring test
2. Positioning anchoring system test, including rising and droping positioning anchor and move ship work
3. Towing gear system test(including towing mechanism's loading/unloading and escorting)
4. All pipelay system equipments single-unit operation test
5. Lifting test
6. Other necessary items

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带格式的：项目符号和编号

A set of necessary inspection, survey, test and sea trail shall be performed during the ship's building process. All inspection and test shall be in accordance with related requirement of the code, rule and procedure issued by ABS and mooring test outline and lifting test outline.

All test result shall be put on records by builder, items refered to code and rule shall be inspected by ABS, the test report shall be approved by the inspect surveyor.

2.10 Warranty

The quanity assurance term to be one (1) year after the delivery of barge.

3 HULL PART

3.1 Main Hull Structure

3.1.1 General

The vessel is to be a barge of welded steel construction, one continue deck, square sides deck and square stern. Two continuous longitudinal bulkheads are fitted from bottom to main deck and eight (8) watertight transverse bulkheads through the whole ship. Middle deck to be fitted below main deck, double bottom to be fitted between side longitudinal bulkheads, tunnel to be fitted respectively in both sides of the double bottom, single bottom to be fitted from side bulkhead to broadside. The main hull structure frame to be included of longitudinal frame system applied in bottom, broadside and deck, supported by transverse strength frame. Space between frames is 700mm.

3.1.2 Material

The hull and all structure steel including cast steel to be marine steel, and to be approved by ABS. The physical and chemical capability to satisfy the relevant rules of ABS. All the steel to be of seamless and have no defects like interlayer etc..

3.1.3 Structure Dimension

The hull structure design to be according to 'RULES OF REGULATIONS FOR THE CONSTRUCTION AND CLASSIFICATION OF STEEL BARGE' of ABS rules. hull structure strength for requirements to use FEM analyze method to confirm the members' dimensions.

3.1.4 Construction

The design drawings of this vessel to be checked and approved by ABS. The ship construction to be satisfied the requirement of ABS classification society and to be supervised by ABS surveyor. The workmanship, quality guarantee, tolerance requirement, test and defect eliminating etc. of the vessel to be according to Chinese Shipbuilding Industrial Standard (CB). The permitted error of structure lining-up to satisfy 'Chinese Shipbuilding Quality Standard' (CSQS) and 'Hull Construction Accuracy Standard'.

3.1.5 Hull Assembling Manufacture

The processing and assembling error to be strictly controlled, not to exceed the permitted tolerance range, and that of the cylinder foundation structure of 3000 tons lifting crane to be especially controlled. The structure assembling not to be

forced moulding in order to avoid generating bigger inner stress and distortion on the members.

3.1.6 Welding

Welding material (including welding rod, electrode metal, flux and protecting gas) used on hull structure to be according to ABS relevant rules and to be approved by ABS. Welding material to be according to the steel class of hull structure. When welding high tensile steel, low hydrogen high tensile welding material approved by ABS suitable for base metal to be used.

Builder to provide the detailed welding workmanship and process to classification society for approval. During welding, appropriate welding spot protecting measure to be applied to avoid influence on welding quality generated by humidity, wind and low temperature, and especially to take attention of reducing distortion and remained stress.

3.1.7 Inspection

After welding hull structure, all welded seam to be surface inspected. The surface of welded seam to be uniformly molded, tight and smoothly transited to base metal, having no crack, more excess height and defects. All welded seam to avoid accidented and bumpy phenomenon, and remedy according to prescribed process and re-inspection to be done when defects exceeding standard occurred, and that to satisfy the classification society.

The inside quality of welded seam to be inspected through radial, ultrasonic or by other method approved by the classification society. The workmanship of no-damage survey and assessing standard to be approved by the classification society.

The builder to specify no-damage defect detecting process approved by the classification society. Times and position of hull welded seam no-damage detection to be discussed by builder and classification society as practice. All high stress area to be no-damage defect detected, at least including main hoist area, pipe support area, positioning windlass area, tightener and A & R winch area. The position and result of no-damage defect detection to be recorded in the report which to be provided to the classification society for approval.

3.1.8 Defect Remedy

Welded seam that not satisfied inspection requirement to be remedied and newly inspected.

The builder to specify the workmanship and process of welding detect remedy according to the requirement of classification society inspection rules of different material in different cases, and that to be carried out after approved by surveyor in order to insure welding remedy quality.

Welded seam to be surface inspected and relevant no-damage detected after remedying. The quality of welded seam to satisfy acceptance requirement

standard.

3.1.9 Tightness Test

After hull construction, hull tightness test to be done before launch to inspect if leakage exist or not. Ship to launch after all inspection checked out.

3.1.10 Shell Plate

Thick plate to be used at the shell opening for reinforcement according to rules.

All liquid tanks, void tanks to be arranged two acid-proof steel discharge plug at the lowest part of diagonal.

Bilge strake to be arranged bilge keel.

Dead wood are arranged in the Aft and Fore hull.

3.1.11 Deck

All decks to be horizontal with no sheer and camber.

Structure load in main deck loading area to be 10t/m2, that in other area to be 5t/m2, that on pipe laying line top deck to be 5t/m2.

3.1.12 Bulkhead

Main hull bulkhead to be flat-plate type with stiffener and girder used for reinforcement.

Stiffeners on longitudinal bulkhead to be horizontally arranged, and that on transverse bulkhead to be vertically arranged.

3.1.13 Double Bottom

Double bottom with 2500 mm height to be arranged between two side longitudinal bulkheads.

Ballast tanks, bilge tanks, tunnel etc. to be arranged in double bottom.

3.1.14 Forecastle and Deckhouse

Forecastle deck and deck house to be transverse frame system.

3.1.15 Helicopter Platform

Helicopter platform to be arranged on top of G deck, eight-square, and to be used for takeoff and landing of SIKORSKY S61N type helicopter.

3.1.16 Ice Reinforcement

The vessel not to be ice reinforced.

3.1.17 Foundation of 3000 T Crane

Crane foundation to be arranged at aft main deck. Hull structure below main deck in crane foundation area to be arranged with support structure, and to be arranged with appropriate longitudinal and transverse support bulkhead used for reinforcement.

Cylinder foundation to be arranged with storage and support, details to see detail design plan.

4 OUTFITTING PART

4.1 Navigation Anchor Arrangement

Two sets of navigation anchor equipments to be arranged on the B-deck. An anchor, anchor chain cable, chain stopper, hawse pipe, chain pipe and windlass to be included in every set.

4.1.1 Anchor

Type： 12900kg Spek

Number： 2 sets

4.1.2 Anchor Chain And Accessory

Anchor chain cables: Diameter Φ87mm, AM3 grade with electro-welded anchor chains，total length 715m (26 pieces).

4.1.3 The Combined Windlass

The vessel will be equipped with two windlasses with type of combined windlass. Each windlass contains one declutchable cable lift, declutch able mooring drum and warping end.

The main technical parameters of the combined windlass/mooring winches as follows:

Part of windlass

Anchor chains： AM3 grade，Φ87mm

Working load： ≥ 359.5 kN

Part of mooring winch：

Rope diameter： Φ80mm

Drum load： ≥200 kN

Capacity of ropes： 200m

Part of warping end：

Load of warping end： 150 KN

4.1.4 Chain Stopper

A roller type chain stopper will be arranged on the place between the windlass and the exit of hawse pipe on deck. The vessel has two chain stoppers totally. bronze bearing，oil spot，stainless steel forelock are to be supplied.

4.1.5 Hawse pipe

Hawse pipes are to be installed in both sides of B-deck, and pipes for cleaning anchor chains are to be included in it. Hawse pipe deck entrance should set breakwater.

4.1.6 Chain Locker

Two chain lockers away from each other are to be arranged under the bow upper deck and their capacity is enough for anchor chains' storage.

4.1.7 Cable Releaser

Cable releasers are to be fitted in the chain lockers and can be operated from outside. The vessel has two cable releasers. bronze bearing，oil spot，stainless steel forelock are to be supplied.

4.2 Mooring equipment

4.2.1 Hydraulic Multifunction Winch

The vessel is equipped with two 200KN hydraulic multifunction winches totally. Both are on the upper deck of stern. Each side has one set.

The main technique parameter as follow：

Part of drum：

Diameter of rope： Φ80mm

Capacity of wire rope： 200 KN

Part of warping end：

Load of warping end： 150 KN

4.2.2 Hydraulic Mooring Capstan

The vessel is equipped with four 150kN hydraulic mooring capstans .

The main technique parameter as follow：

Diameter of mooring rope： Φ80mm

Capacity of mooring rope： 150 KN

4.2.3 Hydraulic Public Pumping Station

This vessel equipped two center hydraulic pump station to supply two hydraulic windlass winch, one mooring winch on foredeck, two multifunction winch ,four mooring capstan in the middle and one mooring capstan hydraulic power at stern.

This pump station use low pressure hydraulic system, valve and pipes，the pressure is around 120 kg，electric form is AC440V，60Hz。

4.2.4 Bollard, Fair Leader, Roller

Both side of upper deck and fore part of B deck enough bollards fair leader, Roller should be equipped for mooring or sea work. Every should be strengthen enough.

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4.2.5 Fenderbeam

Both side equipped wooden fenderbeam to protect vessel broken by other ship. Fenderbeam should be made off hardwood or other promising materials, dimension is abt 300x300x3500mm. wedge in angle iron frame，both side should be nibbed. The lower part of fenderbeam should use anti-fouling paint。Before fixing fenderbeam，hull part inside the fender beam and the frame should be paint with whole ship structure.

4.2.6 Working Boat

The vessel will be equipped with a steel mobile working boat which can seat 10 person provided by ship owner, equiped rubby mat；builder should build suitable foundation for storage, fixing, swing.

4.3 Towing Equipment

4.3.1 Towing Condition

Towing equipment should be equipped base on towing speed 9kn in lentic water.

4.3.2 Towing Eye Pad, Towing Hole, Towing Bollard

Both side of B deck equipped with 2 towing eye pad and towing hole. One towing bollard set in front of B deck along the center line, with towing hole.

4.3.3 Towing Equipments

Towing equipments should based on ABS rules，include but not limit to 1 emergency towing wire rope and 1 set contain beard chain、set square、short tightwire、connect unfixing chain and other towing equipment。

4.3.4 Wire Rope Collect Winch

Wire rope collect winch set at fore part of this vessel.

The main technic parameter as follow：

Capacity of wire rope：200kN

Load of warping end：600kN

Diameter of tightwire：Φ32mm

Winch capacity：200m

4.4 Working Anchor Equipment

4.4.1 Requirments

The working anchor equipments set as 12.

12 STEVPRIS high holding power anchor，each set is 12000kg。

4.4.2 Anchor Rigging

Anchor lines are steel galvanized wire ropes with length of 2500m, diameter of 76mm, breaking strength of 3800kN and number of 12. Each anchor cables equip with the corresponding connections.

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4.4.3 Working Anchor Winch

The vessel will be equipped with 12 positional anchor winches driven by frequency conversion. The positional anchor winches will be operated either locally or remotely at a centralized control station installed in the CCR.

The main performance parameters of the positional anchor winches as follows:：

Diameter of galvanized wire rope：Φ76mm

Duty pull：1100kN （at mid layer）

Mooring speed：abt. 25m/min （at 1100kN）

Holding load：3800kN （at 3RD layer）

Drum capacity： 2500m

The brakes and clutches of anchor winches will be driven by hydraulic or pneumatic control. Every 3 anchor winches contain 1 hydraulic pump or air condition. The brake system should use pneumatic system.

4.5 Life Safing Equipments

The vessel equip with life safing equipments according to the non-short international voyages less than 36 persons passenger ship requirements.

4.5.1 Life Boat

Two totally enclosed lifeboats which can be held about 70 persons will be arranged on each side of B deck. The vessel has four lifeboats totally and two of them are also used as rescue boat. Lifeboat is a whole unit include, it should have licence admit by ship class society。

The main technical data of the lifeboats as follows:

Total length： 8.5m

Carrying capacity of lifeboat: 70

Speed： ≥6kn

4.5.2 Boat Davit

The vessel will be equipped with four gravity luffing arm type davits for totally enclosed lifeboats.

4.5.3 Life Boat Winch

The vessel will be equipped with two 100KN electric lifeboat winches (right or left types are also one).

4.5.4 Rescue Boat Winch

The vessel will be equipped with two 100KN electric rescue boat winches (right and left types are also one).

4.5.5 Liferaft

Eight (8) liferafts which can seat 25 persons each will be arranged on each

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side on upper deck and the stages for inflatable liferaft with hydrostatic releaser are also to be provided.

4.5.6 Liferuft Crane

Each side equipped one set liferuft crane on B deck。

4.5.7 Lifebuoys, Life Jacket and Accessory

Lifebuoys, life jacket, immersion suits, rocket parachute flare signals to meet the SOLAS rules require.

4.5.8 Embarkation Ladder

A embarkation ladder is to be fitted on each side on B deck. The vessel has two totally, with canvas as protective equipment at the same time.

4.6 Signal Equipment

Signalling equipment such as navigating lights, flags, shapes, bells and gong etc. will be provided according to the power-driven vessel's requirements of the 1972 regulation.

4.7 Water Tight Glide Door

Water tight door should be equipped by classified rules.

4.8 Fire Fighting Equipment

The vessel will be equipped with fire extinguishing equipments according to the regulation. (For fire extinguishing system, see engine specification).

4.9 Helicopter Platform

Helicopter platform is eight-sided, contain a round with diameter of 22.3m, and the angle scope of obstruction free zone is 210°. The platform serves for the helicopter type of SIKORSKY S61-N to land or take off.

4.10 Elevator

Equip one muti-pupose elevator，。

Main parameter：

Load weight： 1000kg

Entrance door number：one A60 door

Lifting door number：auto slide door

Speed ： 0.63m/s

4.11 Davit

Load	50T
Quantity	6pcs

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4.12 Painting

4.12.1 Preparation for Steel Surface

If the thickness of steel plates is ≥ 6mm, rust grade should attain to Sa2.5, bar attain to Sa2~2.5. Steel plates should be sprayed shop primer 15 micrometer as soon as possible after cleaning.

Steel should be checked after they cut into piece, Steel surface shall be shot-blasted again after finished block。

4.12.2 Paint Work

All paint storage、prepare、use should base on paint producer require. With out paint producer and owner both admition， paint can't be added extra thinner or desiccant.

4.12.3 Steel With Shop Primer

Builder should impart steel producer the compatibility between shop primer and painting. Especially the storage of shop primer. Thick shop primer should be painted after the preparation of surface.

4.12.4 Repair

Because of improper construct， or mechanical mangle ,the broken painting area should paint a primer, then paint as next step. Area primer been destroyed, surface shall be shot-blasted then use sand paper or file to repair the angle. The final paint， builder should paint wholely. Repair should be finished before deliver the vessel.

4.12.5 Painting Materials

Different paintings should buy from the same producer. Builder and painting producer should insure the quality of painting satisfied with the requirement of the ABS.

4.12.6 Painting Spec

The main body should use epoxy paintings， superstructure outer side use crylic acid painting，inner side use alkyd painting or crylic acid painting，fresh water tank is epoxy drinking water tank use thick paintings. The design service life is 5 years. The thickness should over 250μ， use anti-fouling paint to prevent halobios.

Main body DFT as follow：

Below D.L.W.L.	primer	epoxy	125μm x 2
	Middle painting	epoxy	50 μm x1
	Surface painting	anti-fouling	125μm x 2
W.L.changing	primer	epoxy	125μm x 2
	Surface painting	epoxy	100 μm x1
Freeboard	primer	epoxy	100μm x 2
	Surface painting	epoxy	100 μm x1

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super structure outer surface	primer	crylic acid	100μm x 2
	Surface painting	crylic acid	100 μm x1
Weather deck	primer	epoxy	125μm x 2
	Surface painting	epoxy	125 μm x1
Funnel	primer	heat-resistant	40μm x 2
	Surface painting	heat-resistant	40 μm x1
Mast、baluster、davit	primer	epoxy	100μm x 1
	Surface painting	epoxy	100 μm x1
Drink water tank	primer	epoxy	100μm x 2
	Surface painting	epoxy	100 μm x1
Ballast、black water	primer	epoxy	150μm x 2

All above don't include crane painting。

4.13 Cathode protection

Impressed current equipment will be used to protect the hull parts under waterline.

Sacrificial anodes will be used to protect ballast tanks and suction boxes and service life designs for 5 years.

4.14 Wooden Sheathing

Wooden sheathing will be laid on the left operation area of upper deck.。spec is 100mm thick，breadth~150mm ，length2400mm ~3600mm hard wood。Angle iron fixed around，wooden board end should be covered with steel、inner screw thread joint steel fixed with stainless bolt. Wooden board need embalmment before fixed.

4.15 supplies

supplies base on supply table.

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5 Cabin Part

5.1 Cabin Design Guide Line

Cabin fire-resistant should satisfy 1974 SOLAS rules and other retouches.

Equipments in living area，outfitting，equipments，all should be marine products，certifications written needed，accord with invirnmental standards.

Cabin furniture should made by professional builders, furniture and bulkhead scareboard、ceilling 、deck fixed as usually，or base on furniture builder suggestion. Furniture primary coverd with mutilayer board，face covered fire proof board，painting on furniture and other wooden faces can't include tinder like pyroxylin . single unit equipped high-grade furniture.

All the furniture type should base on cabin arrangement。spring-mattress in living cabin should make by professional maker,armed high quality cloth sofa.（except leather sofa appointed）。

All furniture、upholster、doss and beddings all should be high-standard apyrous products，except specialized，galley、washroom、pantry、scullery、changing roomand other wet space furniture and equipments all should be steel with paint.

Final num of those equipment should be admit by owner before order.all below are primary equipments.

5.2 Cabin Class

Area	Name
Living area	single cabin with apartment、single cabin、double cabin、4-men's cabin
Public area	Inirmary 、pilot rest room、office、Data storage、meeting room 、Crew's mess room、Officer's mess room、Decker rest room、Lounge、Gymnasium
Control area	Central control room、battery room、fire control station 、emergency generator room 、CO_2 room
Passage area	Interior walkway、ladder、lift、emergency escape
Sanitation area	Sanitary unit、public toilet、bath room、cleaning room、dressing room
Service area	Galley 、high temperature galley、laundry and dry room、worker laundry、dressing room 、boiled water room
Food storage area	Lobby 、dry provision store、fish store 、meat store 、vegetable store 、dairy store.
Mechanical area	Air comdition room、air condition unit room、fan room 、vice engine fan room、main engine fan room、fan room for engine

	case、lift、pipelaying switchboard room、engine case、assistant engine room、winch room、pirifier room、cable vent-pipe.
Working area	Electric control room、watching room、ADTcontrol room、dark room、jointing equipment repair room、machine repair room、middle collating room、tube shelf control room、NDT checking room etc.
Storage area	Store、electric store、linen store 、gally store、equipment checking storage、AUT specimen storage 、jointing material storage 、depot

5.3 Cabin Arrangement

5.3.1 Cabin Equipment

Class	Cabin	Berth size	Bathroom
Senior cadre	single cabin with apartment	2000x1000	Sanitary unit（with shower）
Cadre	single cabin	2000x1000	Sanitary unit（with shower）
	double cabin	2000x1000	Sanitary unit（with shower）
Sailor	4-men's cabin	2000x1000 （Bunk bed）	Sanitary unit（with shower）

5.3.2 Furniture Equipment

Common

5.4 Sanitary Equipment

All sanitary equipments should be high standard.

5.5 Cabin Inner Adorn

5.5.1 Gerenal Principles

Inside fireproof should base on 1974 solars rules.

5.5.2 Cabin Net Height

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Cabin net height is height measure from deck covering upper face to ceiling bottom。Normally ， sanitary net height is 2000mm ， other place net weight is 2200mm 。

5.5.3 Furniture

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Steel furniture with paint should be equipped in galley and laundry

Other cabin use wooden furniture，Laminated wooden board with 2mm fireproof board。

5.5.4 Hardware

Hardware for furniture is chromeplate copper.

5.6 Insulation

Suitable location.	Insulation .	
	Material .	Thickness（mm)
Place need A15 、A30 、A60 base on rules.	Mulriple alumina board, density 90 ±l0kg/m3.	Bulkhead ： 25 + 25. Ceiling ： 20 + 20.
Ray point-blank place, heat fountainhead, sound fountainhead.	Mulriple rock fibre board, density：42 ±5kg/m3.	Ceiling ： 100 . Bulkhead ： 75.
Air conditioner room, emergency engine room and other convulse and yawp room.	High-powered damper .	Bulkhead: 1. 5 ~2 times of armor plate .

5.7 Deck Covering

Living area include walkway（except bathroom, washroom, toilet）should cover with covering base on rules.

Deck base covering.	Deck face covering.	Suitable location.
10mm light primary deck coverings or A-60 class Anti-fire primary deck coverings.	2mm plastic floor .	Living area 、 public area.
	3mm rubber floor.	Center control room、inner corridors、ladders.
Deck or A -60 class Anti-fire primary deck coverings.	5mm epoxy coverings.	Toilets、service room、battery room.
	Painting .	Other cabin.
Camber fill and level up covering.		On camber where it needed.
Air conditioner room 、emergency engine room and other convulse and yawp room.	High-powered damper.	1. 5 ~2 times of armor plate.

5.8 Cabin Equipment

Serial Num .	Name .	Num .	Note .
1	Cooking range 6 ＋heater board 1 baking oven	1 1	

	Cooking range 4 heater board.		
2	Caldron induction cooker	1	Bowl shape steelboiler and stockpot
3	multi-purpose machine（40L).	1	With meat chopper
4	Dough mill（25kg powder）	1	
5	Baking oven （ Fermentation double attemperator）.	2	
6	Dishwasher（60 basket lhr)	1	
7	Disinfection case（350L).	2	
8	Filth disposer（300kg / hr ）	2	
9	Declinable electric stockpot（6 OL)	2	
10	Declinable electric frying pot（4 OL)	2	
11	Deep frying pan（with firefighter）(2X15L ）	1	
12	Steamed rice box（42 kg)	2	
13	Electric-steaming braising box（5 blocks）.	1	
14	multi-purpose slice machine	2	
15	Meat chopper	2	
16	Flay machine（15 kg ）	1	
17	Vegetable cut machine	1	
18	Cake machine .	2	
19	Rice washer 25 kg/once.	1	
20	Water boiler（45L)	2	Hang on bulkhead
21	Fridge 500L	2	
22	Microwave oven	2	
23	Electric cooker（19L)	4	
24	Can opener	2	
25	Double washbowl Washing table (stainless steel).	4	
26	Washing table (stainless steel).	4	
27	Working table (stainless steel).	6	
28	Dish shelf (stainless steel).	4	

29	Bottle shelf (stainless steel).	2	
30	Cup shelf (stainless steel).	2	
31	Flavoring shelf (stainless steel).	2	
32	Chopping block（stainless steel with rack and knife）.	4	
33	Trash can (stainless steel).	4	
34	Trash can (stainless steel).	4	

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5.8.1 Washroom equipments:

No	Name	E deck wash / dry room.	B /D deck wash / dry room.	Deck worker wash room.	Total.
1	Wash machine（10kg）	1	Each 2	1	8
2	Industry dryer（10kg).	1	Each 2	1	8
3	Industry wash machine（15kg ）			2	2
4	Industry clothing drier （15kg ）			2	2
5	Industry wash machine（20kg ）			1	1
6	Industry dryer （inpat with 20KG Industry wash machine）.			1	1
7	Steam electric iron	1	Each 2 .		7
8	Wash board(stainless steel).	1	Each 2 .	2	9
9	Iron board.	1	Each 2 .		7
10	Cloth barrel.	1	Each 2 .	2	9
11	Stainless steel shelf	1	Each 1 .	1	5
Note：equipments can be changed based on cabin arrangement.					

5.9 Door And Window

5.9.1 Door

Name	Type	Net breadth（mm)	Location
Weather tight steel door	Single handle、quick on-off door	600 ~ 800	Lead to weather steel door.
Stainless steel sliding door	With glass window、on orbit.	900	Center control room.
Sound isolated	With glass window.	700	Engine control room.

airtight steel door			
Fire proof door	Steel A class fire-resistant door.	600 ~ 800	A class fire-resistant door.
	Steel B class fire-resistant door.	600 ~ 800	B class fire-resistant door.
	Steel C class fire-resistant door.		C class fire-resistant door.
Aluminous hollow door	With rectangular window.	600 ~ 800	The second door in inner walkway.
Steel door	Non water tight door.	700	Non water tight request door.
	Abates door.	700	Non water tight request door.

5.9.2 Window

Name	Transparency size（mm)	Type	Location
Rectangular window in center control room	Height 1000 , breadth equal to design.	Fixed thermostat glasses	Windows in Control room front bulkhead 、 back bulkhead and part of side bulkhead
Fixed rectangular window in center control room	Height 1000 , breadth equal to design.	Isolative window	Other window in control room.
Steel rectangular window	450X630	Fixed type、open type	A 、B 、C 、D 、E deck.
Steel porthole	Φ400	Fixed with storm hatch	Upper deck.
Papyrus service window	1000X600	Slide type	Galley.

6 ENGINE PART

6.1 Generating system

6.1.1 summarize

4sets main generators lay engine room, supply 450V 60Hz power。Generators ruuning condition can be controlled in E.C.R.The generators can operate in parallel, stop or start near generator.according to the load,single generator can be invest or quit.

1 emergency generator lay in emergency generator room, burning MDO.

6.1.2 Main generator sets

4 generators，public seat,start by compress air,panel control unit of generator and other accessory equipments should be complement.

Main generator parameter:

Diesel engine

Sets：4

Rating power：2640KW

REV：720 rpm medium speed diesel engine

Burning ：MDO

Generator

No：4

Capacity：3125 KVA

Rating power：2500kW

Power factor：0.8

Voltage：450V

Frequency：60 HZ

Rev： 720 rpm

6.1.3 Emergency generator sets

Emergency generator sets according to parameter:：

Diesel engine

NO：1

Power：345KW

Rev：1800 rpm

Generator (no brush,air-cooling, with silicon steel flange gyrator

NO：1

Rating power：315kW

Power factor：0.8

Voltage：450V

Frequency：60 HZ

Rev：1800 rpm

6.1.4 Exhaust system

Equipment exhaust should according to anti-pollution rule ,acquire centificate.

6.1.5 Incinerator

The vessel use the marine oil incinerator , use to burning liquid and solid waste.Equipment exhaust should according to anti-pollution ,acquire centificate.

6.2 Hull system

6.2.1 Summarize

The section mention equipment number and parameter just to be consulted, to show the number in the design moment, by extractitude calculating, can change the parameter. it should according to the detail design.

All the system about main engine, the SM is about MANB & W diesel generator sets. Shipowner should accept the last choice of maker .

6.2.2 Pipe and valve

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The vessel adopt seamless steel tube.the thick is according to the table:

nominal dianeter	O.D	A	B	C	D	E
1O	17	2.5	2.5	3		
15	22	3	3	3.5	4.5	
20	27	3	3	4	4.5	
25	34	3	3.5	4.5	6.5	
32	42	3	3.5	4.5	6.5	
40	48	3.5	4	5	6.5	
50	60	3.5	4	5	6.5	

65	76	3.5	4.5	6	8	
80	89	4	5	7	8	
100	114	4	6	8	9	
125	140	4.5	6.5	9	1O	
150	168	5	8	11	13	
200	219	6	9	11	13	
250	273	6.5	1O	12	16	
300	325	7	1O	12	16	
350	377	8	1O	12	16	
400	426	8	10	13	16	
450	480	8	10	13	16	
500	530	9	13	13	16	

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6.2.3 Pump

All kinds of pumps should acquire ABS certificate which class require

For fuel oil pump and lub pump, setting oil pan on the engine foundation,oil pan'oil drain pipe dia ≥25mm, setting boom in the sucking of deck fuel oil .

Pump' material:other part according to the standard of manufacture.

Bronze can be replaced by stainless steel, mechanical sealing choose famous trademark.

Oil pump (cog wheel pump,screw pump):

Pump' material according to the standard of manufacture

The pump should install suitable size safty valve

The pump is usually vertical,except for special instruction.

Every pump' inlet and outlet should equipped with pressure gauge and cock.

Attention to choose the pump, avoiding the pump is working in the biggest cathode press head continuous.

6.3 Bilge water system

6.3.1 system describing

Bilge water system including:

2 bilge pump

2 service bilge pump

1 bilge water oil-water separator,including alarm equipment

1 bilge water oil-water separator sewage pump

4 chain-locker injecting pump

6.4 Ballast water system

6.4.1 system describing

Ballast system including：

4 ballast water pump and ballast water pipes

A electrical control hydraulic autuator butterfly valve operation system and ballast water monitoring system

6.5 Seawater cooling system

Engine room auxiliary engine room set 2 seawater doors, standby and port board have 2 sets.

Two engine room' seawater doors connect each other by cross pipe, two terminal of joint sets suction filter, setting valve in the front-end and back-end of filter.

Every independent pump is equipped with small filter.Every center cooling system seawater suction sets seawater fine strainer. Seawater door sets air pipe on the top.air pipe should install cut-off valve. The compress air decompressed blow suction grating of hull through the compress air pipe with valve.

Seawater cooling pump , fire fighting pump and sea water evaporator' seawater injecting pump suck seawater from cross pipe ,which cool different fresh water system

Seawater door cross pipe and filter size should satisfy the requirement of sucking seawater when 1 filter is cleaned. Seawater cooling system should fall into 3 secondary system:

1 Generator sets fresh water cooling system to be cooled by seawater cooling system;

2 Seawater cooling system to be used to cool auxiliary equipments'(air conditioning , refrigerating installation and so on) freashwater cooling system.

3 Windless seawater cooling system

6.6 Fresh water cooling system

6.6.1 Summarize

Fresh water cooling system should fall into secondry system,

Cooling fresh water system(generator sets）

Cooling fresh water system(auxiliary equipments)

Cooling fresh water system(windless)

6.6.2 Cooling fresh water system(generator sets)

A integrate high and low temperature fresh water cooling system supply cooling water to 4 generator sets,satisfy the requirement of 3 sets operate simultaneity .

Every diesel generator set has high and low temperature water system,high temperature water is used to cooling jacket water and air compressor' high temperature parts; low temperature water system is used to cooling air compress system' low temperature parts and lubricating oil cooler . cooling fresh water is

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cooled by center cooling system(2xl00%)

6.6.3 Cooling fresh water system (air conditioning)

The system supply cooling water for air conditioning and auxiliary equipments.

System including:

3 cooling fresh water pump

2 center shrouded cooler

6.6.4 Cooling fresh water system

The system supply cooling water for windless.(complement fixed windless)

System including:

2 cooling fresh water pump

2 center shrouded cooler

System sets automatic valve interlocking with windless(the valve open)

6.7 Fire fighting system

6.7.1 System describing

Fire fighting water system including:

2 fire extinguishing pump (1 is foaming pump),installed in the engine room. 1 fire extinguishing pump is installed in the auxiliary engine room(connecting emergency power), 1 injector pump is installed in auxiliary engine room (connecting emergency power).

1 fire water press tank and 1 injecting press tank laying in the auxiliary engine room.

2 fire water press pumps and 2 injecting press pumps are installed in the auxiliary engine room.

Fire water main pipe lay down the A deck, connecting with fire extinguishing pump and fire press tank.

Fire fighting system including seawater main pipe, valve, fireplug, firehose, nozzle and other necessory accseeories and so on; all should satisfy the specification and rule.

According to the regulation requirement, the leg pipe connecting with themain pipe supply fire water to all area, mess deck , helicopter deck and weather deck area and so on. Standby , port borad set a inter shore connection equipment. Setting the release valve at the lowest of fire water system, it can make the whole or local system discharge respective.

Setting sprinkler system in the accommodation area. 1 sprinkler press tankand 2 sprinker press-keeping tanks laying in the auxiliary engine room. Press-keeping pump is used to keeping the press in the fire extinguishing system.

Sprinkler system should fill fresh water into auxiliary engine room’springler tank, service fresh water system supply fresh water. When sprinkler system begin to work, subsequent supplying water will be done by sprinkler tank and sprinkler

pump.

6.8 Helicopter deck foam fire fighting system

Helicopter deck foam fire fighting including :

2 manually foam/ fire monitor ,the capacity satisfy the requirement of helicopter deck area.

1 foam cistern

1 foam proportioning mixer

6.9 Other fire extinguishing equipment

6.9.1 Local engine room spray firefighting equipment

Installing local spray fire extinguishing system near fuel oil engine according to requirement of specification.

Protective area:generator sets, boiler, incinerator, clarifier.

6.9.2 CO2 system of engine room

Appliance: they should be standby, for example: lifting equipment, release control box, air control release valve, hand-operated quick closing valve, nozzle, weighing equipment and so on .

6.9.3 Kitchen C02 fire extinguishing equipment

Every cooking range have a suit, drawing out 4 suits.

6.9.4 Portable fire extinguisher

1 ）Walkie foam fire extinguishing equipment 20L 2sets

2 ）Barrow foam fire extinguisher35L2 sets; 65L 2 sets.

3 ）Walkie foam fire extinguisher 9L ~42 sets

4 ）Walkie dry powder fire extinguisher 10 sets

5 ）Walkie C02 fire extinguisher 38 sets

6 ）Barrow dry power fire extinguisher 3kg 2sets

6.9.5 Pneumatic quick closing valve system

1 valve can be closed quickly outside engine room ,the valves of fuel oil and lub oil system are required by class.

6.9.6 Working air system

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Working air system provides service for them as follows：

Sea chest（decompress to 2 bar)

E/R、Work shop

Sewage treatment unit（decompress to a suitable pressure）

Base plate of crane

Working air joint

Pipe laying line

Accommodation deck and navigation deck

CO2 room

Main deck

Crane

Stinger

Working air system including：

4 sets screw type of compressor

2 working air reservoirs（certificated by classification society），marking safe working pressure.

2 air dryer（installed in auxiliary engine room）

Working air pipe should be zinking. Air pipe, air reservoir etc. should get classification society certify.

The permission pressure of all pneumatic plant and parts should be greater than 10 bars and approved by classification society.

6.9.7 Starting air system

Setup one(1) set of 30bar starting air system approved by classification society，providing service for generating set.

The system including:

2 sets starting compressor（one of them connects emergency power source）

2 starting air（approved by classification society），marking safe working pressure on bottles.

Air reservoir to be provided with air inlet valve, exhaust valve, pressure gauge, leak-off valve and release valve with release pipe connecting to outside safe zone. Compressed air in air reservoir is feed to starting air inlet, i.e. starting air inlet of generator (30 bar), by passing main pipe.

Starting air reservoirs (capacity :2xl.5m3 ） to start each main engine consecutively at least six times (total eighteen times) without replenishment

Intake capacity of air compressors to be capable of refilling two (2) air reservoirs from 0 bars to 30 bars within one hour.

6.9.8 Fire line station compressed air system

Provide one set of 16 bar compressed air system near fire station, supplying working air for pipe laying task equipment. The system to be provided with two sets electric air cooling air compressor with 0.5m3 horizontal air reservoir. Performance parameters to be as following:

Discharge pressure ： 16 bar

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Capacity: 0.15m3 / min, free air.

Installation means, piping layout and control form to be carried out according to pipe laying working requirement.

6.9.9 Working compressor

Quantity：4

Type：common pedestal installed，fresh water cooling，screw，entire type, with after cooler and control panel.

6.9.10 Air dryer

Quantity：2

Type：common pedestal installed，double cylinder，adsorptive

6.9.11 Working air reservoir

Quantity：2

Type：horizontal

6.9.12 Main starting compressor

Quantity：2

Type：vertical, common pedestal, air or fresh water cooling, two grades，with after-cooling and control panel

6.9.13 Main starting air reservoir

Quantity：2

6.9.14 Starting air reservoir (emergency)

Quantity：1

6.9.15 Siren air reservoir

Quantity：1

6.9.16 Air reservoir for control

Quantity：1

6.10 Steam Boiler System

Devices and parameters mentioned in this chapter are only for reference. In the deeper design stage, the above parameters can be modified after accurately calculating.

Setup a set of whole steam heating system to supply heat energy for space. Steam to be lead to air heater of air condition, living fresh water heater, ship warming radiator and other heating arrangement.

The system mainly includes two steam boiler, four boiler feed pump, one set chemical agents plant, hot well unit and pipeline with necessary valves, control apparatus and accessory .

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6.11 Fuel Oil System

Provide one set of whole fuel oil system and it has the functions of fuel oil service, transfer, immiting and discharge. Filling pipe to be connected main deck bunkering station with fuel oil storing tank and to be provided with two different sizes of quick couplings and accessory. (including each one 20m and 30m hose with joint, so as to be oiling condition when ex store of the ship.

Provide one flow meter with flow totaliser to measure the oiling quantum conveniently. At the same time setup one water content detector of fuel oil.

6.12 L.O. System and Slop System

Engine room to be provided with a whole L.O. System, service for four sets of generating units. Also，engine room sets a set of whole dirty oil storing and transferring system.

Dirty oil of dirty oil tank is from generating sets (dirty L.O., dirty leaking fuel oil), oil pan and L.O. separator residue.

Dirty oil tank and residue tank are emptied by residue pump.

The system to be according to MARPOL requirement.

All oil tanks which need heating to be provided with heating temperature control device.

All L.O. tanks and cabins to be provided with heating coil (stainless steel 316L).

The system has the functions of supplying L.O. for diesel, draining dirty oil, separating and storing dirty oil. In order to achieve the centralized purifying of L.O., set special L.O. purifying settling tank and pureness tank after purified.

6.13 Fresh Water Generating System

The ship supplies two sets of fresh water generator in auxiliary E/R. The generators firstly suck water from main sea water pipe by passing self-cleaning sea water filter matched with the system. The water generated by fresh water generator discharge to fresh water storing tank after passing chlorination sterilizing plant.

Provide antisepticising catchment plates around the fresh water generators.

6.13.1 Fresh water supply system

Fresh water supply system sucks water from fresh water tank. The system is not including closet flushing water. Closet flushing water is sea water. Fresh water filling pipeline to be provided with flowmeter.

Each fresh water tank to be provided with independent suction pipe and to be connected to main suction pipe with valve and the water can be transferred from one tank to any other tank. Fresh water supply system supply water for each working station according to the requirements of pipe laying line.

6.13.2 Closet flushing system

Closet is flushing by sea water。

The system to be provided with one set frequency-changing sanitary sea water

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supply unit, Capacity：12m3/h, 6bar .Set two pumps and each pump has individual frequency-changing drive device. Frequency-changing water supply device to be provided with larger capacity of water storing tank to assure normal water supply.

6.14 Sanitation Water Drain System

Two sets ship-using sewage processing unit to be provided in the bottom of engine room. One of them processes black water and the other process grey water.

The device to be according to IMO latest rules and set two oil skimmers.

6.15 Air System And Sounding System

All liquid tanks to be with air pipes. In the tanks filled by pumps, the transverse section area of air pipe to be 1.25 large as filling pipe. The size and quantity of air pipe of void tanks to be according to the size and form of void tanks, but not to be less than 50mm.

All air pipes to be with self-closing devices (floating check valve) and to be with flame screen for oil tank and dustproof for fresh water tank. The height of air pipe is 760mm above main deck, meeting the requirement of classification society.

6.16 E/R Mechanical Ventilation

E/R and AUX. E/R totally set six sets of double speeds axial ventilator and three of them can reverse. Set two sets exhauster. The ventilators are located on main deck, intaking air and exhausting by air operating controlled jalousie on bulkhead.

6.17 Work Shop Device

1 ）One set common Lathe

2 ）vertical drill

3 ）one set bench drill

4 ）One set multi-function machine tool

5 ）Two sets grinder

6 ）Bench clamp 6’,8’ : two each

7 ）Fuel injector testing device 2 sets

8 ）Trolley crane or manual chain block

6.18 Others

1 ）Fuel flowmeter one

2 ）Fresh water flowmeter one

3 ）piezo-tank level measuring and four points draught remotely measuring device 1set

4 ）ballasting system electric/hydraulic butterfly valve remote control device 1 set.

5 ）exhaust gas silencer and spark extinguisher 8 sets

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6 ）engine room warm air blower 20 sets

7 ）water-tight removable door（between main engine room and AUX. engine room, between main engine room and sewerage treatment room） 1 set

8 ）weathertight blind door / window some

9 ）fresh water、fire-fighting water、working air and portable fire extinguisher to be transferred to every welding station according to pipe laying requirement. Every welding station to be provided with welding air supply pipe.

6.19 Engine Room Monitoring Device

Diesel generator to be controlled and monitored by distribution board.

Control console of engine room 1

Integrative alarm panel

Oil water tank level remote measurement, four points draft measuring.

Ballasting system electric/hydraulic remote control butterfly valve board (computer software).

Engine control room water cooling air-condition 4 sets（refrigeration/heat type）

Ship service power unit etc.

6.20 Tank

1 ）Oil tank

All oil tanks/cabins to be proper strengthened full welding steel structure and to be hull structure as far as possible. All tanks/cabins are designed to be easily coming into for convenience of checking and cleaning. The cabins should be designed to have manhole or handhole, air hole and discharge connecting fitting. Accessories, such as content gauge, thermometer, heating coil, and so on, to be installed according to the specification. Provide thermostat according to requirement.

Oil tank/cabin bottom to be provided with oil pan and discharge pipe.

2 ）Water tank

All water tanks to be properly strengthened full welding steel structure. All water tanks to be designed to have handhole or manhole for easy inner checking and cleaning.

Water tank to be set air hole and discharge connecting fitting. Accessories, such as content gauge, thermometer, heating coil, and so on, to be installed according to the specification.

Vent pipe of L.O. and sewage tank to be lead to chimney.

6.21 Pipeline And Others

6.21.1 Sea Chest And Shipboard Drain Outlet

Main/AUX. engine room to be separately provided with one main pipe of sea water with one high/low sea chest and to be with closing/opening state indicator. Sea

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chest to be steel welding structure and its arrangement position should prevent air sucking in the ballast condition. Every sea chest to be provided with one cropper sea valve and anti-corrosive zinc plate and anti-corrosive antifouling plant. Shell plate of each sea chest has some grating holes.

Each sea chest's top to be provided with big enough air pipe and hole with copper stop valve.

Each sea chest to be provided with blow pipe of compressed air and steam.

Each outboard drain to be provided with copper stop check valve.

6.21.2 Filter

First filter of oily water in pipeline commonly to be basket type（filter）

6.21.3 Vent-pipe

Vent-pipe of engine room to be made of steel plate coated with antirust paint or galvanized steel plate. Every branch pipe tuyere to be with hand-adjusting air brakd.

All ventilators can be shutdown outside the engine room (air oil cutting off).

6.21.4 Chimney accessory

Back side of chimney top to be arranged with engine room exhaust outlet. The exhaust outlet to be arranged with air operating remote control jalousie connecting to outside. Jalousie can be shut up emergently outside the chimney.

Inside chimney to be arranged with grating and vertical ladder, for the convenience of checking, maintaining and cleaning. Chimney deck has proper passageways and doors.

Chimney to be provided with drainpipe. The drainpipe is lead to a proper position.

6.21.5 Workshop and material room

Set workshop in engine room.

Engine room to be provided with enough spare parts and tools. Grating walkway floor to be laid in pipe tunnel. Pipe tunnel to be provided with bilge water high level alarm device, normal/emergency lighting, ventilation installation and normal/emergency access road.

6.21.6 Nameplate

All pumps, air compressors, heat exchangers, and so on, to be supplied nameplates marking with principal spec parameters and alarm plates by manufactory, but also the control boxes of that to be set brass nameplates marking marine names and numbers of facilities. All nameplates to be engraved with chinese and english.

6.21.7 Floor, Grating And Ladder

Engine room to be provided with checkered plates, gratings and ladders for check, operation, maintaining of all machinery and as passage way to outside.

The place under checkered plates to be provided with movable cover where set pipeline fittings and to be hinge joint. The movable cover to be provided with

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accessory name indicator. Bracket to be welding connection fastened in principle, but to be removable bolt connection where pipes, accessory and device need to dismount.

Grating

For observation and ventilation convenience, to provide gratings on each floor in engine room opening. The structure and material of grating to be according to shipping standard CB608 -67.

Ladder

The width of main passage ladders to be 600 - 700 mm and the inclined base angle to be about 50 - 60 ° . All the bolts of ladder to be joint with hull and to be removable when equipments overhaul.

Railing

For the safety and convenient operation, provide railings on the balcony, ladder opening and deck opening according to practical situation. Railing is composed of handrail, bracing and fastener. Install removable railing locally where need often overhauling. Structure and material of railing to be according to CB609 – 68.

6.22 Paint

Piping and valves in engine room to be painted after installed. All pipes to be painted in different color according to their functions for easy identification.

6.23 Spare Parts and Facility

Spare parts of machinery to be according to manufacturer's standard and provide statutory spare parts according to ABS. In addition, provide spare parts of one year.

6.24 Pipe Laying Line Supplying System Of Welding Protective Gas

Laying a main pipe from welding gas storing cylinder to pipe laying line. Provide enough supplying gas header of welding protective gas with valves and quick coupling in each welding station (totally seven).

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7 ELECTRIC PART

7.1 General Principle

7.1.1 General

The vessel's electric system and installation shall be designed, constructed and installed compy with the Rules and Regulations of ABS (including modifications). All the electric equipment shall according with the marine condition and obtain the certificate which recognized by ABS.

7.1.2 Electric power source

Name	Voltage (V)	Frequency(Hz)	Phase	Wire
Main generator	AC450	60	3	3
Emergency generator	AC450	60	3	3
Crane motor	AC440	60	3	3
Anchor winch motor	AC440	60	3	3
Ballast pump motor	AC440	60	3	3
Normal and emergency lighting	AC220	60	1	2
Temporary emergency lighting	DC24V			2
Galley equipment	AC440/220	60	3/1	3/2
General electrical equipment	AC440	60	3	3
Automation system of communication and navigation equipment	AC220/DC24V	60	1	3

7.1.3 Cable

Location	Type	Name of cable
Electric and lighting equipment cable	CJPF86/SC	XLPE insulation, PO inner sheath, tinned copper wire braid, PO outer sheath, bunched flame retardance low-smoke halogen-free
Communication and control cable	CHJPF86/SC	XLPE insulation, PO inner sheath, tinned copper wire braid, PO outer sheath, bunched flame retardance low-smoke halogen-free

Fireproof cable	CJPF86/NC CHJPF86/SC	XLPE insulation, PO inner sheath, tinned copper wire braid, PO outer sheath, bunched fire-resisting low-smoke halogen-free
Interior connecting line of equipment	CBVR/SA	PVC insulated flexible cable

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7.1.4 Color and nameplate

All the color of electric equipments shall be indicated in the ordering technical agreement.

Nameplate to be used for marking the name and symbol of equipment. Scutcheon to be used for indicating attention. And all of them can be fixed by bolt.

Electric equipment which have interior connection shall be attached with schematic diagram and connection of connection number.

7.2 Check and test

The vessel's electric equipment's check and test shall be according to the requirements of "Schedule of electric equipment test". Surveyor shall attend the test of general electric equipment, but the important equipments' check and test shall be attended by relational departments.The test shall be well annaled, and the report shall be put on records.

7.3 Power

7.3.1 General

The vessel's electric plant consist main generator , emergency generatorand interrelated transformer as following:

Main generator	4 sets	AC450 60Hz 3PH Insulated system
Emergency generator	1 set	AC450 60Hz 3PH Insulated system
Main transformer	2 sets	AC450/AC230
Emergency transformer	2 sets	AC450/AC230

Four (4) sets of main generator can extended parallel running.

Main generator and emergency generator shall be interlocked with each other.

Lighting transformer shall can be little parallel running to transfer load.

Shore connection shall be interlocked with each generator.

The vessel shall be equipped Power Manage System (PMS) with following function: four main generators can parallel running by manual, quasi-synchronization and autoparalle;main diesel engine shall be provided with balance accommodation of dynamic and static state power dispensatory;the system can unload the unimportant load; generator shall be autoparallel with bus; load distribution/ dissymmetry load control; frequency control; start/stop generator bases on the load;

lock jump management; automatic synchronizer and breaker control; alarm and event handling; figure display and man-machine interface; main generator to be interlocked with emergency generator; shore power to be interlocked with each generator and so on.

When in port, the vessel shall use shore power for lighting and living devices.

7.3.2 Generator

The technical standard of generator as following:

	Main generator	Emergency generator
Quantity	4	1
Phase	3	3
Rating power	2500KW	315KW
Rating voltage	AC450V	AC450V
Rating speed	720rpm	1800rmp
Frequency	60 Hz	60 Hz
Degree of protection	IP23	IP23

7.3.3 Transformer

The technical standard of transformer as following:

	Main transformer	Emergency transformer	Separated transformer
Quantity	2	2	9
Phase	3	3	3
Capacity	400KVA	100KVA	
Primary voltage	AC450	AC450	AC440
Secondary voltage	AC230	AC230	AC440
Frequency	60Hz	60Hz	60Hz

7.3.4 Battery

Capacity /Ah 600（emergency power）

400（low voltage power）

200（radio power）

Voltage /V 24 (2X12 in series)

Quantity 3 sets（one for emergency power, one for low voltage power, one for radio power）

7.3.5 Shore power

Capacity /KW three phases 600

Voltage AC440

7.4 Switchboard

7.4.1 General

The vessel's switchboard consist main switchboard and emergency switchboard.

1. Structure

Type of installtion： vertical type（with shockproof and waveproof measure）

Insulation class： IP22

Appropriate size of insulation rubber mat, insulation glove and relieving stick shall be installed beside all the switchboard.

2. Inlet of cable：bottom

Note：except generator,all exterior feeder cable shall be connected to the premeditated terminal of main switchboard.

7.4.2 Main switchboard

Main switchboard include motor panel, paralleling control panel, AC440V feeder panel, AC220V feeder panel and group panel etc.

Main switchboard shall be equipped with: generator control panel equipped with voltmeter, ammeter, double-cursor frequency meter, wattmeter, synchronizing instrument, running cycle counter. Each panel shall be equipped with multi-function protective relay, surveying parameter shall be choiced in the faceplate, switchboard shall can remote control the starting and stopping of generators, auto paralleling, auto distributing of load, auto stepped unload, protection of scale differential relay, protection of reverse power, auto trip and other function of power staion. At the same time, relevant manual funcation shall be provided.

Indication light：according to the requirements of purchaser and design demand.

Control and choice switch：according to the requirements of purchaser and design demand.

7.4.3 Emergency switchboard

Emergency switchboard shall provide power to emergency load. After auto-starting of emergency generator, the switchboard will give the signal of trip after auto-trip device checking the voltage and frequency. Then emergency power shall be switching-on, including emergency generator control panel, AC440V feeder panel, group panel and AC220V feeder panel.

7.4.4 Main switch

The switch of main generator to be four (4), emergency generator to be one(1). All the switch shall be according to ABS rules and requirements.

Maker： SCHNEIDER

Character：draw-out type,electric close brake

7.5 Distribution device

Distribution device consists of distribution box of supply power, lighting, navigation etc. and charging and discharging box, shore power box, test box and other distribution device.

7.5.1 Power distribution box

Circuit shall be branched through breaker, 3 phases 44OV or 3 phases 22OV.

Quantity abt. 30 个（3 phases 440V ）（final quantity shall according to electric equipment）

abt.10 个（3 phases 220V ）（final quantity shall according to electric equipment）

7.5.2 External power switch box

Voltage：3 phases 440V 、supply power /kW 600

（concurrent with shore power box)、quantity：1 set

Voltage：3 phases 440V 、supply power /kW 200 、quantity：2 sets

Voltage：3 phases 440V 、supply power /kW 100 、quantity：2 sets

Voltage：3 phases 220V 、supply power /kW 20 、quantity：4 sets

7.5.3 Lighting distribution box

Circuit shall be branched through breaker, 3 phases 22OV single-phase feeder power and DC 24V power.

Quantity abt. 30 个（final quantity shall according to electric equipment）

7.5.4 Navigation and communication box

Circuit shall be branched through breaker, 3 phases 22OV single-phase feeder power and DC 24V power.

Quantity two (2)（3 phases 220V) , one (1)（direct current 24V)

7.5.5 Charging and discharging box

Type of changing: floating，automation, manual

Input voltage: AC440V with rectifier

Output voltage: 24V - 36V

Mode of changing: constant-current

Quantity 2 sets

（one for emergency power, one for low voltage power）

7.5.6 Shore connection box（concurrent with 600kW external power box）

Voltage：3 phases 440V ，wattmeter/kW：600A，phase-sequence can self-transform with phase-sequence indicator.

7.5.7 Electric test device

Voltage 3 phase 440V , single-phase 220V , DC 24V

The device can test and repair the small power motor, flourescent lamp, incandescent lamp and other electric equipment.

7.5.8 District group starting panel

Voltage: 3 phases 440

The control voltage of each starter to be 220V, the power to be provided by one separated transformer in the starter whose secondary winding shall be earthed in one side. Based on every circs, start/stop buttom, manual/stop/automation switch, on-site/remote switch ect. Shall be equipped. The starter which with dampproof heater shall be equipped with open/close of heater and blue heating indicator light.

The vessel's tightener, A/R winch, crane, anchor winch ect. shall use frequency conversion control .

7.5.9 Anchor winch control device

Anchor winch use AC frequency conversion timing system. The winch can be controlled in the winch and winchor console of central control room. The vessel shall be equipped 12 anchoe winches and power supply from switchboard.

7.5.10 Ballast pump

Ballast shall be powered from breaker of main switchboard. It adopts soft-starting of group starting panel.

Ballast can be controlled from central control console, in-situ and ballast starting panel.

7.5.11 Control of other equipment

The motor whose emergency power more than 75kW shall adopt star-delta starting, other motor shall adopt direct-on-line starting of magnetic starter.

7.5.12 ECC

Engine control room shall equipped engine control console to be the equipment for centralized control and running control of engine electric equipment.

7.5.13 Central control console

Central control room shall be equipped with Central control console. As the central monitor and running control of the vessel.

7.5.14 Anchor winch console

Central control room shall be equipped with anchor winch consol which shallbe equipped with the following equipment:

1. governor control and running parameter ammeter of motor of 12 sets anchor winch
2. running parameter instruments of 12 sets anchor winch
3. television monitor display device of anchor winch room and importment parts of the vessel

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7.5.15 ballast system console

1. Central control room shall be equipped with ballast system control console.

7.5.16 Piping console

Central control room shall be equipped with piping console for piping work. It can manual/auto control tightener and A/R winch, and have the function of indication and alarm of piping equipment.

7.5.17 Piping indication table

Central control room shall be equipped with piping indication table for indicating the working state of welding station and accomplishment of working, also for the alarm system of ship's moving. It also equipped CCTV monitor and control unit, audible and visual indication and control buttom.

7.6 Lighting

7.6.1 Lighting fixture and fitting

Amperite of all fluorescent lamp shall be electronic type.

7.6.1.1 Non-waterproof type

Accommodation, central control room, public and cabin with fireproofing structural shall be equipped with non-waterproof lamp.

7.6.1.2 Waterproof type

Outdoor, weather area, machine control room, piping working space, engine room, lavatory, bathroom and cabin with fireproofing structural shall be equipped with steel or copper waterproof lamp.

7.6.1.3 Explosion proof type

Battery room, painting room and other man-trap shall be equipped with explosion proof lamp, the dgree of protection shall be IICT3. The switch shall be waterproof and installed outside the door.

7.6.2 Low voltage socket box

Engine room, hydraulic pump station, engine monitor room, charging anddischarging room, central control room, air-conditioner room, workshop etc. shall be equipped low voltage socket.

7.6.3 Navigation and signal light

7.6.3.1 Navigation light

The control unit of navigation lamp shall be equipped in central console and with alarm function of lighting fault and power supply fault. Navigation lamp shall adopt copper double deck annular lamp.Navigation lamp shall be equipped according to International Convention for the Prevention of Collision at Sea.

7.6.3.2 Signal light

The control unit of signal lamp shall be equipped in central console and with alarm function of lighting fault and power supply fault. Signal lamp shall adopt copper lamp. Signal lamp shall be equipped according to International Convention

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for the Prevention of Collision at Sea.

7.7 Interior communication

7.7.1 Command telephone

The vessel shall be equipped one (1) set of command sound power telephone with function of precedencing switch on when busy. The sound power telephone between central control room and engine, central control room and crane room to be straight-through and with combined aural and visual display function. The sound power telephone between central control room and engine monitor, A/R winch room, CO2 room, emergency generator, orientation winch room, piping line shall adopt selective switch on type. The power to be DC24V.

7.7.2 Auto telephone

The vessel shall be equipped one (1) set of auto telephone (abt. 240 lines) and it shall be powered by AC220V and emergency AC220V.

Extension shall be installed in central control room, engine monitor room, dining room, meeting room, captain room, chief engineer room, hydraulic pump station, air-condition room, piping line, accommodation etc. the telephone which be installed in the noises space shall be equipped soundproof armet.

7.7.3 Broadcast

The vessel shall equipped one (1) set of marine loudspeaker (double amplifier) with 1W monitor loudhailer. The main loudspeaker shall be installed in the central control room, the power of AC220V and DC24V can be auto transformed. It shall accord with the requirement of passenger ship.

7.7.4 Broadcast TV antenna and marine satellite broadcast TV

One (1) set of b roadcast TV antenna shall be installed in the central control room for receiving local broadcast TV program, playing DVD, receiving satellite TV program in the ship.

7.7.5 Engineer calling device

The vessel shall equipped one (1) set of engineer calling device which installed in the engine monotir room. Fixed type responder shall be installed in the chief engineer room, first engineer room, second engineer room, electrician room, dining room, meeting ect. the supply power to be DC 24V.

7.7.6 Hospital calling system

The vessel shall be equipped one (1) set of hospital calling system. The calling switch shall be installed in the sick room, the alarm signal shall can be connected to hospital room and central control room with buttom of silencer.

7.7.7 CCTV

Monitor shall be installed in the following consoles of central control room.

7.7.8 LAN system

The vessel shall be equipped LAN system

LAN shall can data traffic with shore through satellite comm. F. LAN system shall

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be installed true edition system software, operating system and necessary internet applications.

7.7.9 Audible and visual group alarm panel

Engine room, auxiliary engine room and engine monitor room shall be equipped audible and visual group alarm panel of different audible and visual signal to distinguish different signal. The working power to be AC 220V. Fire alarm

7.7.10 Fire alarm

One fire alarm panel shall be installed in the ECC. Each accommodation, dining room, meeting room, importment working room shall be equipped of thermal detector, smoke detector, explosion-proof type detector. Alarm buttom shall be installed in the engine hatch, piping line and walkway of each floor. when any detector or alarm buttom act, the fire alarm panel shall give audible and visual signal. If it without attention in two minutes, the signal shall be auto connected to general alarm system to give audible and visual signal to passage of sailor, engine room, crane room etc.

7.7.11 General alarm

One general alarm unit shall be installed in the ECC which include alarm unit, general alarm buttom and every kinds of annunciator. As unilateralism sender of general alarm system, the alarm signal shall be received by all accommodation, working room and open deck. So broadcast of audible and visual alarm and general alarm shall be installed in interior walkway, working space, ladder etc. And the broadcast shall be connected to fire alarm.

7.7.12 Watertight door alarm

The vessel shall be equipped waterproof door alarm. When watertight closing, doorside and central control room shall give alarm signal.

7.7.13 CO2 release alarm system

The vessel shall be equipped one set of CO2 release alarm system. Thealarmsignal shall be output to audible and visual group alarm panel. At the same time, contact signal shall be given to cut-off the relevant fans and oil pumos and provided CO2 giveaway signal to engine room monitor alarm system.

7.7.14 Engine room monitor alarm system

Technical requirement:

Monitor and alarm system is the system of data collection and monitor and alarm which based on the computer control system.

The alarm data of main switchboard shall be connected to monitor alarm system through general line.

The vessel's level remote system shall be connected to monitor alarm system through general line.

7.7.15 Master clock system

One set of master clock shall be installed.

All the secondary clock shall be display the local time.

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7.7.16 Miscellaneous

Each welding station shall be equipped the display of working state and working finished of all welding stations and buttom of working state and working finished display of this working state. The display of working state and working finished of all welding stations also shall be installed in the piping display table. The the alarm system of ship's moving shall be equipped audible and visual alarm for piping working.

7.8 Navigation equipment

7.8.1 Echo sounder

The vessel shall be equipped two (2) sets of echo sounder with function of shallow water alarm.

The maximum depth shall not less than 300m, the minimum shall be 0.5m.

7.8.2 DGPS navigation system

The vessel shall be equipped two (2) sets of DGPS navigation system. Each set shall include display unit, antenna and power device. The system shall output signal to radar and GMDSS console etc.through signal distributor.

7.8.3 Gyro compass

The vessel shall be equipped with one set of gyro compass with repeater for outputting signal to radar.

7.8.4 Marine meteorograph

The vessel shall be equipped one set of meteorograph with anemorumbometer sensor, thermometer and air pressure sensor. Display shall be installed in the central control room.

7.8.5 Weather fax receiver

The vessel shall be equipped one set of radio weather fax receiver for receiving and printing radio weather fax picture. It shall be installed in the central control room and equipped with receiver, printing unit and antenna.

7.8.6 Clean view screen and window wiper

The front window of central control room shall be equipped with clean view screen with function of electric heating. Parts of front window and behind window shall be equipped with translatory window wiper with function of heating.

7.8.7 Whistle

The vessel shall be equipped one set of whistle. The control box shallbeinstalled in the ECC. The mast of E deck shall be equipped one whistle and one foglight. Manual buttom shall be installed in the appropriate place of central control room.

7.8.8 VDR

The vessel shall be equipped one set of VDR for recording parameter and state of navigation equipment.

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7.8.9 AIS

The vessel shall be equipped one set of AIS system.

7.9 Radio communication equipment

7.9.1 General

The radio equipment include GMDSS radio equipment, satellite comm. F, appropriative super shortwave radiostation for helicopter's communication and navigation and radiophare receiver.

GMDSS radio equipment include GMDSS console, navtex receiver, life boat two-way VHF radiophone, EPIRB and radar responder. The equipment shall be equipped according to requirement of GMDSS A1 + A2 + A3 navigation area and rules of ABS.

7.9.2 GMDSS

GMDSS includes the following equipment:

1. One (1) set of MF/HF radio station, the sending power to be 500W.
2. VHF radiophone

   Four (4) sets of VHF radiophone shall be equipped, one shall be installed in the central control console, the remote control unit shall be installed in the dining room; one in radio space; one in winch control room. 1- satellite comm. C .The system shall be connected to shipping security alarm system.
3. A piece of satellite comm.C remote control panel shall be installed in the central control console.
4. DC24V emergency light shall be installed in the station and powered by radio standby battery.
5. GMDSS operation table

7.9.3 NAVTEX receiver

The vessel shall be equipped one set of navtex receiver and the incepting frequency to be 518KHz. The system shall be installed in the central control room for auto incepting, choosing, storaging and printing the information from coast radio.

7.9.4 Satellite comm. F

The vessel shall be equipped one set of satellite comm. F（Fleet77 ）in the central control room for communication, fax, video frequency meeting, browsing the internet and transmitting data in high speed.

7.9.5 Super shortwave radio station

The vessel shall be equipped VHF/AM super shortwave radio station in the central control room for communication with helicopter.

7.9.6 Navigation radiophare（NDB）

The vessel shall be equipped one set of navigation radiophare（NDB ）for sending navigation signal to helicopter.

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7.9.7 Other radio equipment

Life boat two-way VHF radio telephone 3 sets

EPIRB 1 set

Search radar responder（SART） 2 sets

Twenty sets of HX350S type radio interphone（156 - 174MHz) with six standby battery and relevant charger.

7.10 Miscellaneous

7.10.1 Shipping security alarm system（SSAS)

Shipping security alarm system shall be equipped for sending weft through satellite comm. C when in danger. The buttom shall be installed in the shelter space.

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8 VENTILATION, AIR CONDITION AND REFRIGERATING SYSTEM

8.1 Ventilation System For Accommodation

8.1.1 General

Mechanical ventilation and natural ventilation system will be applied at working compartments which are not covering in air conditioning system. The ventilation system will content to the requirement of air exchange ratio. The ventilation system in air conditioning compartments will achieve positive draft.

8.1.2 Air exchange ratio

The air exchange ratio of main cabin:

NO	Ventilation Area	Mode of inlet air	Air exchange ratio(T/H)	Mode of air draft	air exchange ratio(T/H)	Remark
1	toilet unit	return air by condition	/	mechanical	15	
2	cleaning room	return air by condition	/	mechanical	5	
3	store (life quarters)	return air by condition	/	mechanical	5	
4	liner locker	return air by condition	/	mechanical	5	
5	air condition room	natural	/	mechanical	8	
6	air condition unit room	natural	/	mechanical	20	
7	infirmary	condition	8	mechanical	10	
8	laundry/ drying room	inlet air of local air-conditon	/	mechanical	15	
9	changing room	inlet air of local air-conditon	/	mechanical	10	
10	kitchen	inlet air of local air-conditon mechanical	10 10	mechanical	40	
11	meeting room	centralize air-conditioner	8	mechanical	10	
12	dinner room	centralize air-conditioner	8	mechanical	10	
13	central control room	centralize air-conditioner	10	return air by	1	

		spare package air-conditioner		condition		
14						
15	playroom	centralize air-conditioner	8	mechanical	10	
16	gymnasium	inlet air of local air-conditon	8	mechanical	10	
17	lobby	inlet air of local air-conditon	8	mechanical	10	
18	fire control room	inlet air of local air-conditon	5	mechanical	5	
19	pipelay electricity distribute room	inlet air of local air-conditon	/	mechanical	pending	
20	electricity control room	inlet air of local air-conditon	5	return air by condition	/	
21	winch room	natural	/	mechanical	20	
22	emergency generator room	mechanical	20	natural	/	
23	frequrncy converter room	Inlet air of local air-conditon spare package air-conditioner	/	mechanical	pending	
24	transformer room	natural	/	mechanical	pending	

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8.1.3 Ventilating fan

Mechanical ventilation is mostly served by centrifugal fan, axial flow fan and tunnel fan, explosion-proof fan will be no spark type. If ceiling is fixing under the lifting place of fan, access door or removable ceiling shall be set, size and place according to construction site.

8.1.4 Design of air duct

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Medium(low) speed ventilation system shall be supplied in ventilation design of air-conditioner, and designed according to resistance standard in principle. The air duct is galvanized steel monolayer spiral duct or rectangular duct. Spiral duct, rectangular duct and other accessories will be constructed and installed according to the maker’s technical requirement of the air duct.

8.1.5 Drain plug for air duct

Drain plug shall be fitted for seepy position of air duct as CB/T532-1999, position and quantity shall be confirmed by construction. Hanger of rectangle air duct is designed according to CB/T210-1995, installing position shall be confirmed by construction, distance is commonly about 2m~4m. The “open” and “close” position of airduct register shall be marked on the body case, hand hole or removable ceiling(hanging ceiling) shall be set if ceiling is fixing under airduct register.

8.1.6 Fireproofing air brakd

Fireproofing air brakd shall be arranged if required(accompanied with automatism close and manual close, indicator for showing the state of air brakd shall be provided), to satisfy the requirements and rules.

8.1.7 Weathertight cover

Weathertight cover can close exteriorly shall be arranged at inlet and outlet from ventilating system to outside space. The binding bolt and screw for the cover shall be stainless steel material.

8.2 Air-condition System

8.2.1 Design Condition

Summer

The air conditioning system is designed to achieve the temperature of dry bulb thermometer at 25˚C(more or less 1˚C) with relative humidity at 50% (more or less 5%) in its covering areas when outer environment is 40℃ with relative humidity at 70%,temperature of fresh water is 36℃.

Winter

The air condition system is designed to achieve the temperature of dry bulb thermometer at 20˚C with relative humidity at 40% in its covering areas when outer environment is -20˚C.

Fresh air criteria

Living compartment: 28.8M^3 /H Per person

8.2.2 Air-condition areas

Living compartment;

Office;

Reference library;

Infirmary;

Dining room(local air draft);（not examine as 8.2.1）

Changing room(local air draft);（not examine as 8.2.1）

Lobby(local air draft);（not examine as 8.2.1）

Meeting room(local air draft);（not examine as 8.2.1）

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Engine control room and radio room（spare direct air-cooled conditioner)；（not examine as 8.2.1）

Playroom；（not examine as 8.2.1）

Kitchen（special indirect air-conditioner）；（not examine as 8.2.1）

Transducer room（special indirect package air-conditioner）（not examine as 8.2.1）

Gymnasium；（not examine as 8.2.1）

8.2.3 Air-condition mode

Two packaged air conditioners shall be respectively provided for E.C.R as spare except the central air-conditioner. (The packaged air conditioners shall be with refrigeration compressor and direct expansion system, environmental protection refrigerant R-407C). The air conditioner for the kitchen is independent, indirect, 100% fresh air type. Others are first recirculated air from insulation air pipe, fix air quantify indirect expansion type central air conditioners, air shall be supplied to each cabin after once treated(heated, wet, filtrated, etc) in indirect air-condition by air-duct system, to keep cabin at stated temperature and humidity. In summer, the cooling medium is supplied by cooling-water machine, in winter steam is used for heating and weting.

8.2.4 The cooling and heating medium of central air-conditioner

Cooling medium of central air conditioning system is chilling water from three (3) sets of marine screw compressor chilling units with central fresh water cooling, environmental protection refrigerant R-407C,two shall be working, the third one shall be stand by.

8.2.5 Ventilation system for air-conditioner

Medium(low) ventilation system shall be supplied in centlation design of air-conditioner, and designed according to resistance standard in principle.

The end of air-conditoner air supply is exhaust fan with damp, grid with fire damper shall be supplied to the return air port.

Flexible joint will be used to connect all air-duct and exhaust fan, the length is 300mm.

Construction and installing of spiral duct of air-conditioner and accessories, fabricating of rectangular air-duct, material of rectangular air-duct, requirement of hanger of air-duct, drain plug and register of air-duct, requirement of fireproofing air brakd and fresh air port shall be same as venlation system.

8.2.6 Water pipe system of air-conditioner

Intermedium water pipe of air-conditioner is pipe, flanged or welded connection, flanged connection shall setup oil-proof rubber(not asbestos) spacer. 25mm thicknes(at least 30mm if header pipe) rubber heat insulating material shall be supplied for pipeline (include pipeline fittings and valve etc.)

8.2.7 Control of the air-conditioner system

1. PLC auto operating and safe protecting control will be set in the cool water machine, it can auto work under the designed temperature, and the terminal user can work under the designed temperature. The safe control include: compressor inlet/outlet pressure protection, compressor oil-pressure protection, voltage protection, cooling water pre-freezing protection, interlock protection or loss-of-coolant protection for cooling medium water and chilling water etc.
2. Summer indirect air-conditioner shall control intermedium water volume in flow regulating valve by inducing temperature of return air though thermostat, indirect fresh air-conditioner by inducing temperature of inlet air. Winter indirect air-conditioner set up steam flow regulating valve and humidity control, by inducing temperature of return air. Indirect fresh air-conditioner can control heating and wetting steam capacity by inducing temperature of inlet air, to make temperature of heating compart achieve design condition.
3. Seperated water-cooled package air-conditoner shall be included operating and control protecting system, it can automatic operate as per created condition if connected cooled water and power from ship.
4. Seperated air-cooled air-conditoner shall be fincluded operating and control protecting system, it can automatic operate as per created condition if connected power from ship.

8.2.8 Main equipments in air-condition

Screw mode cool water machine 3 sets(2 in use 1 by standby)

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environmental protection refrigerant R-407C,

1 set include:

1set screw half-obdurate cooler compressor (imported with original packaging)

electrical expend valve support (imported)

compressor, can start up unloading by energy regulation

1 set evaporator, end bracket is removeable for cleaning heat exchange pipe,

Condensator: 1 set, end bracket is removeable for cleaning heat exchange pipe,

Every refrigeration loop include oil separator, high and low pressure release element, filtration dried, humidity indicator, expansion(import), cryogen and freeze oil afflux element, etc. PLC full automation function control box(including automatic function and safety protect) and self diagnose indicator, involved long-distance alarm signal output.

1. Marine indirect fresh air conditioner

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It is necessary to supply intermedium water adjustable valve, temperature transducer, transmitter, actuator, electric cabinet, humidity control pressure guage, thermometer, water(steam) filter, etc.

2. Marine indirect air conditioner

It is necessary to supply intermedium water adjustable valve, temperature transducer, transmitter, actuator, electric cabinet, heating and wetting steam solenoid valve, pressure guage, thermometer, water(steam) filter, etc.

3. Marine water-cooled package air-conditioner

4. Marine air-cooled air-conditioner

5. 3 sets cool intermedium water pump, 2 in use 1 by standby

6. Marine manostatic apparatus: 1 set

7. Exhaust fan

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8.3 Mess Deepfreeze System

The design condition of mess deepfreeze system is accordance with the air-condition system.

8.3.1 Design parameter

Capacity: 310 persons, 60 days(vegetable store letdown to 30 days)

Refrigerator include: fish store、meet store、dairy store、vegetable store and dry povisitions store, etc.

8.3.2 Structure of refrigeratory

Refrigeratory is assembled prefabricated sheet installed scene and epispastic type, horniness polyurethane foam and colored composite sheet; door is double face panel and horniness polyurethane foam heat insulation material; inner shelf and hanger are steel type, maker shall accomplish prefabricating, installing, surveying, panel arranging for panel above mentioned, supply foaming, inner shelf, hanger, support shelf of fan, door and dischatge opening for refrigeratory.

8.3.3 Refrigerator plant

High temperature store cooling installation: 1 series, consisted 2 sets compressor(import), 2 sets condensator, 2 sets valve palte, all above is one in use one stand by.

Low temperature store cooling installation: 1 series, consisted 2 sets compressor(import), 2 sets condensator, 2 sets valve palte, all above is one in use one stand by.

9 PIPE LAYING SYSTEM

9.1 General

The main component of Pipelay line comprising:

Loading And Unloading Of Pipe

Storage of pipe

Carrying roller and centering system

Pipe cleaning, handling and welding system

Pipe centering

Welding inspection system

Tensioner and A&R winch system

Auxiliary system of corrosion protection and coating

Stinger system

Workstation, access and platform

Coating equipment

Work compart: stinger control room, tensioner field control room, testing apparatus store, NDT store, NDT handling room, dark room, welding equipment repairing room, welding material store, etc. Air-conditioners, enough steeliness office furnitures and shelfes, etc. are supplied in work compart.

Other auxiliary system: lighting, emergency escape trunk, fire fighting equipment, video cameras, broadcast, distribution panel, source receptacle, public compressed air, welding equipment shelf, ventilating equipment, potable water, fresh water for cooling, sea water for cooling and eye-washing apparatus.

9.2 Loading And Unloading Of Pipe

Pipes are supplied by transport ship when pipe laying, if climatic condition allowed, transport ship lean against the pipelay ship, move the pipe to storage or directly to carrying roller by pipe crane.

A pipe crane is supplied, arranged at pipe laydown area on the port.

9.3 Storage Of Pipe

Deck plank: pipe storage area is arranged at both sides of Manitowoc crane on the port of main deck. Two storage area shall be used and connected by deck plank, specific requirement of deck plank see the drawing of outfitting.

9.4 Carrying Roller System

Carrying roller is used to carry pipe vertically and transversely, pipe shall be lifted to vertical carrying roller by Manitowoc crane, pillar assisted pipe to lay down and collision-preventing device is designed at one side of carrying roller. Groove handling, preheating and degaussing shall be completed on transverse converye when pipe is in prepared area, after that pipe will be moved to centering station. Certering shall be accomplished by one set centering piece for pipe. Pipe shall be welded by full automation welding equipment in 5 welding stations, automatic NDT

demage inspection by 6th station, 6th and 7th station can also acted as demage inspection and repair station.

9.5 Pipe Cleaning, Handling And Welding System

Pipe cleaning: pipe cleaning shall be carried out before groove handling, by pneumatic tool or electromotion tool, so the Builder shall arrange compressed air and power supply.

The Builder shall outfit enough auxiliary welding system.

Welding protective gas distribution system: 1 series

Automatic welding movement platform, rail and other matched apparatus: 5 series

Gas bottle storage shelf for tube heating

Welding material store

9.6 Centering Apparatus

Function of centering apparatus is aligning the pipe no-welded with welded sea pipe, it comprised centering roller equipment, inner aligner, tension winch of inner aligner, align control room, etc.

9.7 Inspection System

One NDT shall be equipped for pipelaying.

9.8 Tensioner And A&R Winch

Tensioner is used to control pipe in pipelaying, A&R winch is used for recovery and abandon pipe.

Two series composited 100t tensioner shall be equipped.

Maximum tension capacity (each): 100 t

Overall pipe outside diameter range: 4" to 60"

Drive type: frequency conversion electric

A 200 t A&R winch shall be installed pipelay operating line aft, complete with:

Max. tension capacity: 200 t

Drum cope capacity: 1200m

Diameter of hawser: 76mm (according maker)

Drive type: frequency conversion electric

Tensioner and A&R winch is also consisted one series frequency conversion power unit, one series remote control device, spare part for track shoe, etc.

9.9 Coating System

Two coating station shall be set for pipe joint corrosion protection and insulation in pipelay line,

Coating device is configured when pipelaying, the Builder shall provide public service interface in coating station, such as proper distribution panels, compressed air, etc.

9.10 Fire Line

Fire line of operating line is laid above main deck, onto carrying roller system in closed line, related to carrying roller system, used for emergent pipe transport by travelling system when local carrying roller system is disabled, ensured pipelay continuity.

Fire line through closed line can transport pipe to preparing area longitudinally, then transport to the other side of preparing area transversely, final transport to front of tensioner longitudinally.

Fire line of main operating line is cut above the first tensioner, continued to stern after the second tensioner.

Seven series electric hoist rating load is 20t shall be supplied for pipe maintaining and transporting of operating line. Two series electric hoist rating load is 10t shall be supplied for groove apparatus lifting; one series electric hoist rating load is 5t shall be supplied for ramp tool lifting of operating line.

Striking SWL mark and code shall be signed on travelling crane and rail.

9.11 Stinger

A fixed stinger shall be installed to support the pipe in the overbend as it departs from the stern.

Stinger is collected with hydraulic bolt, point H connected stinger and point H connected cross arm, trolley installed on the stinger and measure device monitoring stinger. The Builder shall accomplish installing and testing of stinger.

Other equipment following shall be supplied by the Builder:

Link construction for stinger and hull, higher local strength.

A frame base and spreaderhwar of fixed tinger;

Stinger control room.

9.12 Station、Access And Platform

All welding station area in firing line shall be supplied proper height floor for easy passing, confirmed by detail design drawing. Checkered steel plate is partly applied as required, part is galvanized grid, removable type.

Galvanized grid is used to floor in station, for setting access to overflow paint and water.

9.13 Other Auxiliary Systems

9.13.1 Compressed air

The Builder shall locate a distributing system for compressed air. Compressed air shall be distributed to each used equipment from central compressed air supply depot, such as pipe surface treating machine, centering station, welding station, NDT station, coating station, pipe cleaning station, cooling station and repairing station, at least two quick release coupling shall be provided in each workstation to supply air for minitype machine and temporarily use.

9.13.2 Power socket

The Builder shall supply, install and hook-up all dynamical and controlling cable of all equipment. At least two 220V/440V source receptacles shall be furnished near each place, such as pipe surface machine, centering station, welding station, NDT station, coating station, pipe cleaner and repairing station, to supply power for petty power equipment. Dust cap is used when power socket is unused.

9.13.3 Alarm and monitor system

A suit of sound and light alarm system shall be supplied by the Builder.

Sound and light alarm system is furnished in each station. The signal allowed pipe move will be indicated when pipe is accomplished welding, NDT, repairing and coating.

Pipelay CCTV system shall be connected with whole CCTV system, may monitoring the pipelay condition in wheelhouse.

9.13.4 Other system

It is necessary to equipped other auxiliary apparatus as detail design requirement, such as lighting, broadcasting, ventilating, emergency access, fire-fighting system and eye-washing apparatus.

10 Heavy marine crane

10.1 General

Stern installs a (fixed type)3000t/2000t (completely rotary type)marine engineering hoister. Hoist is drived by electric power.the power is supplied by generatoring station of vessel.

Electromotion winchs' generators of hoist adopt A.C. frequency converting control.

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Design and use condition

Main claw completely rotary type,situation I :

Safty working load 2000t completely rotary

Working radius 35m completely rotary type(outboard span 12m)

Vessel most heeling 3.5°

Vessel most trimming 3.5°

Wind force and wind force factor according to the requirement of class.

Variable load (including light weight and hoist load) coefficient is .1.10

Main claw is fixed(no back line) mode situationII：

Safty working load 3000t

Working radius30 m ixed aft mode(out borad span 14.6m)

Vessel most heeling 1.5°

Vessel most trimming 1.5°

Wind force and wind force factor according to the requirement of class.

Variable load (including light weight and hoist load) coefficient is .1.10

Auxiliary claw completely rotary mode situationIII：

Auxiliary claw safty working load 600t

Working radius 60m (outboard span 37m）

Vessel most heeling 3.5°

Vessel most trimming 3.5°

Wind force and wind force factor according to the requirement of class.

Auxiliary claw safty working load 30 t

Vessel most heeling 3.5°

Vessel most trimming 3.5°

Wind force and wind force factor according to the requirement of class.

10.2 Main parameter

带格式的：项目符号和编号

Every behavior parameter:

Main claw completely rotary:

Safty working load x working radius	2000 mt @ 35m
Main deck jacking height when least working radius	> 80m
Most working load hoisting speed	O – 1.5 m/min
Part load hoisting speed	O - 3 m/min

Main claw (no back line) fixed aft hoister.：

Safty working load x working radius	3000 mt @ 30m
When 35 m working radius, deck hoisting hight	> 80m
Most working load hoisting speed	1.5 - 3 m/min
Part load hoisting speed	0 - 3 m/min
Hook most entrance depth/ safty working load	5m/3000 mt

Auxiliary claw：

Safty working load x working radius	600 mt @ 70m
When least working radius , main deck hoisting height	> 100m
Most load hoisting speed	0 - 10 m/min
Hook most entrance depth/safty working load	150m/600 mt

1 hooklet(function of person lifting):

When most working radius, the safty working load	30mt
When least working radius, main deck hoisting height	＞95m
When most working load, the hoisting speed	0 - 60m / min
The hoisting speed according to specification when person lifting	

Rotary :

When part load, the rotary speed	8min/cycle
Idle rotary speed	4min/cycle