

授权会签
总体
结构
舾装
轮机
管系
通风
电气

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PART 1 GENERAL PROVISIONS

1.1 Definitions

The following terms to be used for the design and construction of the 90m Self-Elevating Unit:

Unit – The 90m Self-elevating Unit, being Hull No. DSME1206;

Owner – Tianjin De-Sail Machinery Equipment Co., Ltd., who signed the shipbuilding contract with the shipyard for the Unit;

Builder or shipyard – Jinhai Heavy Industry Co., Ltd.

Buyer – The Party who will purchase the Unit from the Owner;

Classification Society or Class – American Bureau of Shipping (ABS);

Fixed load – The load of the facilities that are fixed on the Unit permanently and constituted a part of the Unit's lightweight, including but not limited to the living quarters, helideck, cranes, diesel engines, generators, pumps, electrical equipment and other fixed equipment, cables, equipment foundation, pipes, wires and the liquids in the above said equipment and pipes for normal operation.

Movable fixed load – The load of the facilities that are fixed on the Unit permanently as part of the lightweight, but their position can move relative to the hull, such as the legs and spudcans.

Variable load – The load of the stuff that can be removed, consumed or moved during operation, divided into the solid variable load and liquid variable load, including but not limited to the crew, FO, LO, potable water, living supplies, deck store, the temporarily installed parts and the load transferred to the crane foundation when the crane is working.;

Environmental Load – The loads induced by the ocean environment, such as the wind, wave and current, which are necessary for the calculation;

Operating water depth – The depth from seabed to the design high water level, including astronomical tide and storm tide;

Air gap – When the Unit is raised to operational position, the distance between the water level and base line of the hull.

1.2 General

This specification to provide a detailed description of a completely outfitted and equipped Unit. Upon the delivery, the Unit to possess all the functions as described in the specification and meet the delivery conditions of the contract.

1.2.1 Purpose of the Unit

The Unit to be a self-propelled, self-elevating unit designed and built for the offshore oil field service at the operation water depth of 5~60m.

1.2.2 General description

The hull of the Unit to be rectangular box-type structure. The main dimension of the hull to be 63.6 m in length, 40.0 m in width, and 5.8m in depth.

The Unit to have 4 cylindrical legs, each fitted with a square shaped spud can at its lower end. The leg length to be 90m (excluding the spud can). The dimension of each spud can to be 11.7m in side length and 1.5m in height.

Four (4) sets of hydraulic-rack & pinion jacking system to be equipped for lifting or lowering the Unit.

The main hull to have three deck levels which are the double bottom, lower deck and main deck. The main deck to be divided into two parts which are the living quarter and free deck. The free deck area of the Unit to be around 1500m².

The Unit to be equipped with two rudder-propeller systems driven by main diesel engine and one bow thruster driven by electrical motor. The Unit to be equipped with DP1 system. The Unit to be equipped with one 190t main crane and one 20t auxiliary crane for the offshore services.

The Unit to be equipped with two (2) sets of electric anchor windlass.

The living quarter of four levels to be arranged on the main deck at the fore part of the Unit for the accommodation of 300 persons. The emergency generator room to be arranged on the third level. The jacking control room and the mast to be arranged on the top of the living quarter. The helideck to be located at the front of the living quarter with diameter of 22.2m to be suitable for landing Sikorsky S-92.

1.2.3 Design principles

The Unit to be designed in accordance with the rules of ABS and the relevant international rules and regulations. The design principles to be listed as follows:

- Unit towing conditions and floating stabilities are in conformity with the requirements of the Class;
- Equipped facilities are easy to operate and maintain;
- Design unit adopts metric system.

1.3 Classification and Rules

1.3.1 Classification

The detail design is approved by ABS.

Class Notation: ABS, ✕A1, Self-Elevating Unit, ✕AMS-NP, ✕DPS-1, CRC, CPS

1.3.2 Flag state

Flag State: Panama

1.3.3 Rules, regulations and conventions

The construction of the Unit to refer to the following existing applicable rules, regulations and conventions:

- International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), as amended.
- MARPOL Annex I (Oil) IV (Sewage) V (Garbage) VI (Air Pollution).
- IMO Resolution A.1023 (26) "Code for the Construction and Equipment of Mobile Offshore Drilling Units" (2009)
- Guide for Building and Classing Mobile Offshore Unit (2008).
- IMO International Load Lines Convention and Protocol for International Load line Convention (1988).
- International Tonnage Measurement 1969
- Performance Standard for Protective Coating of dedicated seawater ballast tanks (PSPC)
- API Spec 2C-2012 Offshore pedestal-mounted cranes 7th edition
- ILO 92/ILO68
- Maritime Regulations of the Registered Country/ Flag state
- IMO MSC/Circ.884 ANNEX "DRAFT GUIDELINES FOR SAFE OCEAN TOWING".
- IMO International Regulations for Preventing Collisions at Sea (1972)

1.4 Certificates and Technical Documentations

Upon delivery of the Unit, the following certificates and technical documents to be provided:

- Offshore Self-Elevating Unit classification certificate
- International Oil Pollution Prevention Certificate
- Supplement to the International Oil Pollution Prevention Certificate,
- IOPP-Form A
- AIS Survey Checklist
- Check Sheet on SOLAS Surveys-SLR/GMDSS
- EPIRB Annual Testing Certificate
- SSAS Test Report
- GMDSS RECORD

- International Load Line Certificates
- Survey of Load Lines
- The Tonnage Confirmatory Survey
- International Tonnage Certificate (1969)
- International Air Pollution Prevention Certificate
- Supplement to International Air Pollution Prevention Certificate
- International Sewage Pollution Prevention Certificate
- Statement of Compliance for the Prevention of Pollution by Garbage from Ship
- International Anti-Fouling System
- Record of Anti-Fouling System
- Certificate of test and examination of Cranes or Hoists and their Accessory Gear
- Statement of Fact ILO 92
- Statement of Fact ILO68
- EIAPP
- Mobile Offshore Unit Safety Certificate

1.5 Design Conditions and Design Criteria

1.5.1 Design environment conditions

1. Design max. operating water depth: 60m (197 ft, including astronomical tide and storm tide)

2. Design temperature

Ambient temperature: $>0\text{ }^{\circ}\text{C}$, $\leq 50\text{ }^{\circ}\text{C}$

Sea water temperature: $2\text{ }^{\circ}\text{C}\sim 36\text{ }^{\circ}\text{C}$

Air Humidity: 85% (Ambient temperature $50\text{ }^{\circ}\text{C}$)

Steel design operating temperature: $0\text{ }^{\circ}\text{C}$

3. Design wind speed

Normal operating 36 m/s (70 kn)

Storm survival 51.5 m/s (100 kn)

Limited towing conditions

Intact stability, field towing 36 m/s (70 kn)

Intact stability, ocean towing 51.5 m/s (100 kn)

Damaged stability 25.7 m/s (50 kn)

1.5.2 Design operating condition

Design conditions	Water Depth (m)	Max. wave height (m)	Wave period (s)	Wind velocity (m/s)	Current at surface (m/s)	Current at seabed (m/s)	Air gap (m)
Working condition 1	60	6.3	7	25.7	1.03	0	8
Working condition 2	32	6.3	8.3	36	1.03	0	20
Storm condition	30	9.5	10.2	51.5	1.8	1.03	9
Crane working	60	6	7	15.5	1.03	0	8

Above data is based on:

- Class approved calculation method.
- Penetration is 3m.
- The length of leg is 91.5 m (including spud can).
- Without marine growth.
- According to the P-delta effect and dynamic amplify coefficient.

1.5.3 Design towing condition

The following defined data of towing conditions to be used for the stability calculation and structure strength analysis during the platform towing works.

Condition	Hull draft(m)	Wind Speed(m/s)
Field towing	3.0	36
Ocean towing	2.885	51.5

1.6 Main Dimensions and Main Design Parameters

Length overall	approx.	85.1 m
Width overall	approx.	51.0 m
Length moulded		63.6m
Breadth moulded		40.0 m
Depth moulded		5.8 m
Design draught		3.0 m
The whole length of the leg (include spud can)		91.5 m
Center distance between legs:	longitudinal	44.4 m
	transverse	33.0 m

The dimensions of spud can		11.7mx 11.7m x1.5m
The effective areas of spud can		136.89 m ² x4
Design Leg Penetration depth		3 m
The diameter of the helicopter platform		22.2 m
Speed	approx.	4.2 Knots
Living Quarters		300 persons
Gross tonnage	approx.	7894
Net tonnage	approx.	2368

1.7 Main Performance

Maximum operating water depth		60 m
Design ambient temperature		>0 °C, ≤50°C
Jacking system		Hydraulic, rack and pinion
Normal lifting capacity of jacking system		5600 t
Jacking speed for hull		0.6 m/min
Jacking speed for leg		1.2 m/min
Free deck area		approx. 1500 m ²
Main crane (1set)		main hook: 190t @ r = 9.5m (min.)
		38t @ r = 40m (max.)
		Aux. hook: 10t @ r=13m~43m
Auxiliary crane (1set)		main hook: 20t @ r = 5.70m~20m
		10t @ r = 30m (max.)
		Aux. hook: 3t @ r=7m~33m
Life boat		4 x 150 persons

1.8 Main Equipment

1.8.1 Propulsion system

Main engine	2 x 1760kW @ 1000rpm
Rudder propeller	2 x 1600kW @ 1000rpm
Bow thruster	1 x 80kN @ 600kW abt.

1.8.2 Power equipment

Main Generator set:	5x450 kW 50Hz 3φAC400V
Emergency generator set	1 x 250 kW 50 Hz 3φAC400V

1.9 Design Variable Load

Design variable load of Unit under different conditions to be as below:

<u>Condition</u>	<u>Design Variable Load</u>
Elevated	1500t
Towing	900t

Note: The variable loads listed above to be part or the combination of the following categories:

- (1) Personnel and their effects, supplies, stores, and spare parts.
- (2) Liquid onboard for operation, such as fuel oil, lubricate oil, fresh water, ballast water, bilge water, and etc.
- (3) Other equipments

1.10 Design Load of Deck

Deck Load Design Table

Main deck (living quarter)	2.4 t/m ²
Main deck (free deck area)	5.0 t/m ²
Lower deck	2.4 t/m ²
Bottom	3 t/m ²
01 Level	1.2 t/m ²
02 Level	0.7 t/m ²
03 Level	0.7 t/m ²
04 Level	0.7 t/m ²
Top deck	0.7t/m ²
Helicopter deck load	According to Sikorsky S-92 helicopter

1.11 Tank Capacity

NO.	NAME	TANK CAPACITY(m ³)
1	No.1SW ballast tank(Port)	241.11
2	No.1SW ballast tank(Star)	241.11
3	No.2 SW ballast tank(Port)	187.23
4	No.2 SW ballast tank(Star)	187.23
5	No.3 SW ballast tank(Port)	223.40
6	No.3 SW ballast tank(Star)	223.40
7	No.4 SW ballast tank(Port)	146.45
8	NO.4 SW ballast tank(Star)	146.45
9	No.5 SW ballast tank(Port)	170.89
10	No.5 SW ballast tank(Star)	170.89
11	No.5SW ballast tank(Center)	371.33
12	Fresh water tank 1	456.72

13	Fresh water tank 2	527.88
14	Fuel oil store tank 1	148.77
15	Fuel oil store tank 2	233.78
16	Fuel oil day tank 1	21.25
17	Fuel oil day tank 2	21.25
18	Galley gray water. tank	51.06
19	Seawater reservoir	322.69
20	Dirty oil tank	12.77
21	Bilge water tank	12.77

1.13 Painting

All paint, coating, and finishing materials shall be high-grade commercial products of a quality according to the “painting scheme” and “painting procedure”.

Surface preparation and painting procedure to be in accordance with the Builder’s standard and paint manufacturer’s recommendation.

Shop primer to be in accordance with the Builder’s standard.

All painting works to be carried out under the supervision of the paint manufacturer’s representative.

PART 2 STRUCTURE

2.1 General

The structure design to conform to the requirements of ABS.

The structure to be designed according to the General Arrangement plan. The type and strength of the structure to meet the requirements of the Class rules.

The structure of the Unit to mainly comprise the hull, jackhouse & leg well, legs and spud cans, living quarter, and helideck.

The main hull to be of a box-shaped structure with a flat bottom, equipped with four legs. When the Unit is elevated, the loads from the hull to be transferred to the legs which are supported by the spud cans.

The superstructure to be located at fore part of the Unit and the helideck to be located in front of the superstructure.

The main structure to be applied with the high tensile steel in accordance with the ABS requirements. Any equivalent materials used as substitutes during construction should be approved by the Classification Society and the Designer.

2.2 Hull Structure

The Unit to be of a full-welded steel structure with longitudinal frame. The general transverse frame space to be 1200mm and the general longitudinal frame space to be 600mm.

The main hull to be divided into 55 frames in longitudinal.

The global strength calculation and local strength calculation of the Unit to meet the requirements of the Rules to guarantee the safety of the Unit.

2.3 Leg Structure

The legs to be cylindrical type, with a length of 91.5 m (including spud can).

2.3.1 Leg racks

Rack materials to be the quenched and tempered steel ASTM A514 GrQ, and A-grade ultrasonic tested. The yield stress to be 723MPa and tensile strength to be 772MPa.

2.3.2 Leg fabrication

The Builder shall have the good comprehensions to the leg structure drawings and tolerance requirements and weld according to the WPS approved by ABS to guarantee the dimension tolerance and welding quality of the legs. All the welding seams of the legs and the permanent lifting points to be examined by 100% UT or 100% MT according to the

requirements of ABS. Unless approved by the Classification Society, no welding or gas cuttings shall be carried out. During the construction of the legs, the Builder to control and check the dimension of the legs to guarantee that the leg joint dimension will satisfy the requirements of the drawings. Meanwhile, the Builder shall submit the leg lifting procedure which is compiled according to the experience of the Builder to the Classification Society for approval.

The materials and properties of all the parts to be approved by ABS.

The leg welding procedure to be developed based on the recommendations of the suppliers. The quality of all the welding seams to meet the requirements of ABS and materials suppliers. The NDT for the remedied defective welding seam to be the same as that for testifying the defect of the welding seam. The defects of the welding seam at the same location to be allowed for remedy only once. If it is still unqualified after remedy, the materials of the welding parts to be alternated and reconstructed.

Special attention to be taken for the hydrogen-induced cracking of high-tension steel that may be caused by hydrogen sulfide. The welding and remedy procedures to be developed by the Builder and submitted to ABS for approval.

2.4 Spudcan Structure

The spudcans to be square with dimensions as below:

Length of side: 11.7m

Max. height: 1.5m

The effective area of spud can: approx: 136.89m²

All the welding seams of the connection between legs and spud cans to be full penetration. According to the stress characteristics of the spud can, FE analysis should be worked out under the most severe combination of various loads.

2.5 Jackhouse Structure

The jackhouse to be arranged for each leg. The jackhouse structure to consist of the leg well, gear box support and wall.

The jackhouse structure could transfer the load from main hull to the legs.

2.6 Superstructure

The superstructure, of rectangular shape, to be located at fore part of the Unit and can be divided into 5 levels in total. Height of each level to be 3m in general. The detailed dimension, shape and materials to refer to the structure drawings and to be locally strengthened where the structure withstands greater force in order to meet the

requirements of its use and strength.

2.7 Other Structures

2.7.1 Helideck structure

The helideck structure to be designed with adequate strength to land the helicopter similar to SikorskyS-92. The diameter of the helideck to be 22.2m. The helideck of the longitudinal framing structure to be connected to superstructure and supported on main deck where the main hull structure to be reinforced. The scantlings to be taken as per the Rules. Furthermore, both the local strength calculation and FE analysis for the strength of the helideck to be carried out.

2.7.2 Crane foundation structure

Two cranes to be equipped on the Unit. The main crane foundation to be connected to the aft-port leg well. The auxiliary crane foundation to be of pillar-shaped structure and the lower part of the foundation to be inserted into and welded to the hull.

2.7.3 Foundation structure of the equipment

The foundation structure to be designed according to the equipment foundation shape and the force of the main equipment. The scantlings to be taken as per the Rules and the strength to satisfy the requirements of Class and the FE analysis of main equipment to be approved by the Class.

PART 3 JACKING SYSTEM

3.1 Jacking System

3.1.1 General

Four (4) sets of rack & pinion jacking systems to be equipped. Each jacking system to compose of 14 sets of jacking units, 2 sets of fixing brackets and 1 set of hydraulic power unit. The jacking systems to have one (1) electrical control system.

Each jacking unit to consist of jacking pinions, gear box, hydraulic motor and brake device. The design and construction of the jacking system to meet the requirements of the Classification Society. The jacking units to be installed on the fixing brackets.

The jacking pinions to be driven by the hydraulic motor, which to be connected with brake and planet gear reducer, and to be engaged with leg racks.

The central control console to be installed in the jacking control room and the local consoles to be installed in the jackhouses.

3.1.2 Technical parameters

➤ Total number of jacking unit	56sets
➤ Number of jacking units per leg	14 sets
➤ Number of pinion per leg	14 sets
➤ Driven pinions width	128mm
➤ Lifting speed for hull	0.6m/min
➤ Lifting speed for leg	1.2m/min

3.1.3 Performance

	Per jacking unit	Per leg
Normal jacking (vertical push on rack)	100t	1400t
Preload lifting capacity	140t	1960t
Normal holding	150t	2100t
Storm holding	200t	2800t

3.2 Auxiliary Equipment

3.2.1 Marks of legs

The marks of 25mm in height and 150mm in width to be provided every one meter on each leg and the marks of 25mm in height and 75mm in width to be provided every half meter on each leg from the jackhouse top to the leg top.

The obstacle mark of red and white bands to be provided at the top of each leg.

3.2.2 Ladders for the legs

The ladder in compliance with the requirements of Classification Society to be provided for each leg.

3.2.3 Cathode protection

Anode of appropriate number and size to be fitted on the spudcans.

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PART 4 DECK MACHINERY

4.1 Anchor and Mooring Equipment

4.1.1 Windlass

Two (2) electric anchor windlasses to be installed at main deck fore part (P & S), with pulling force of 15.2 tone @ 10m/min. and the variable speed control to be located at main deck fore part.

4.1.2 Anchor and Chain (Φ56mm, AM3, 275m+302.5m)

Two (2) bow anchors: AC-14 Anchor, 3937.5kg each.

Chain cables: Φ56mm, AM3, 275m for Portside, 302.5m for Starboard.

4.1.3 Bollard, Fairlead, Loose Mooring Equipment

Eight (8) Bollards SWL=353kN

Eight (6) Chocks SWL=353kN

Five (5) Mooring rope Ø48 6-strand polyamide multifilament rope, 190m per piece

4.2 Towing Equipment

The towing equipment to be fitted on the Unit according to IMO MSC/Circ.884 ANNEX "DRAFT GUIDELINES FOR SAFE OCEAN TOWING".

4.2.1 Main towing equipment

The main towing equipment of the Unit to compose of the towing eye plate, fairlead, towing bridle, set square, short rope, shackle, recovery rope and recovery winch. The minimum documented breaking load (MBL) of the main towline is 1643kN.

Recovery rope to connect with the set square and recovery winch across the chain wheel under the helideck. The working load of the winch to be 35kN.

Main parameters of the recovery winch to be as bellow:

Working load: 35kN

Speed: 12m/min

Braking load: 105kN

Steel wire rope: Ø20mm

Reel capacity: 50m

4.2.2 Emergency towing equipment

The emergency towing equipment of the Unit to compose of the towing eye plate, emergency towline, chafing chain, hauling line, shackle and deadhead. The towing eye

plate and chafing chain to be of the same type as the main towing system. The MBL of the emergency towing system to be not be less than the main towing system.

4.3 Signal Equipment

4.3.1 General

The signal light, shape and acoustic signal instruments to be equipped according to “The International Regulations for Preventing Collisions at Sea, 1972, IMO” and its amendments.

4.3.2 Mast

The red-white-red ring lights, which to indicate the status of the under operation/ out of control, to be fitted on the mast on the top deck.

4.3.3 Side light

The side lights to be placed at both the port and starboard sides on the top of the superstructure.

4.3.4 Stern lamp post

The stern lamp post to be arranged at the stern.

4.3.5 Shape and acoustic signal

The shape and acoustic signal instruments to be equipped according to “The International Regulations for Preventing Collisions at Sea, 1972, IMO” and its amendments.

4.4 Crane

One (1) main crane of diesel hydraulic-driven type and one (1) auxiliary crane of electro-hydraulic -driven type to be installed. The cranes to meet the requirements of ABS and API-2C.

4.4.1 Main crane

Item	Main Hook	Aux. Hook
Safety working load	Max. 190t referring to the load chart	10t
Hoisting speed	4m/min	30m/min
Max. working radius	40m	43m
Min. working radius	9.5m	10.5m
Hoisting height	65m	75m
Time of luff	180s	
Angle of luff	+22° ~ +81°	
Slewing speed (with no load)	0 ~ 0.5r/min	

Max. angle of slewing		360°
Diesel Engine	Model	Caterpillar C18
	Parameter	Power: 492kW
		Speed: 1800 r/min

4.4.2 Auxiliary crane

Main hook	Safety working load	Max. 20t referring to the load chart
	Hoisting speed	21m/min
	Max. working radius	20m
	Min. working radius	5.7m
Aux. hook	Safety working load	3t
	Hoisting speed	60m/min
	Max. working radius	30m
	Min. working radius	5.7m
Hoisting height		54m (On Min. working radius)
Time of luff		140s
Slewing speed (with no load)		0 ~ 0.5 r/min
Max. angle of slewing		270°
Electromotor		Power: 132kW, S1/200kW, S6-40%
		Electric source: AC 400V, 50Hz, 3P

4.4.3 Crane configuration

The main structural components to contain the boom, the delta frame, slew platform, base and so on.

The boom to be a truss structure luffing by wire rope. The four motions which are slewing, main hoist, auxiliary hoist and luffing, can be operated at the rated load.

The boom to be suitable for marine working environment.

The crane's flood-lights and electric equipment installed on the boom to be explosion proof.

4.5 Life-Saving Equipment

4.5.1 Lifeboat

Four (4) 150P totally enclosed and fire protected type lifeboats to equipped on the Unit, with each two to be installed at both port and starboard sides of superstructure. The lifeboats to be diesel driven with electric start. A set of offshore fittings and equipment in compliance with the requirements of relevant Rules and Regulations and IMO MODE Code as applicable to be provided.

11.7m Totally enclosed lifeboat	
Type	Flame retardant
Dimensions (L×B×H)	11.7×3.70×3.65 m
Passenger	150

4.5.2 Davit and winch for lifeboat

The design of the davit to be according to the requirements of the IMO MODU Code and LSA and approved by the Classification Society.

Lowering of boat to be through its own gravity with no need of any other power.

The davit to be installed for boarding the boat in stowed position.

The boat to be lowered by means of remote control that the crew can release and stop the hand brake of the winch from inside of the boat via wire connection to the brake arm and wire spoil on the small drum. Alternatively, the crew can operate the hand brake on the deck.

4.5.3 Fast rescue boat

One (1) fast rescue boat with davit to be arranged at 03 Level.

The boat to have the flexibility and operability under bad weather and the boat can be used for searching and rescue.

6.0m Fast rescue boat		
Dimensions (L×B×H)	6.00×2. 30×1. 00 m	
From hook to keel height	1.8 m	
Passenger	10	
Speed	≥20kn (3P)	≥8kn (10P)

4.5.4 Lifteraft and davit

Twelve (12) crane carrying type liferafts, each for 25 persons with hydraulic release devices, to be provided. The arrangement of liferaft to meet the requirements of ABS and the relevant rules.

Each one davit to be provided on both sides near the liferafts on main deck. The davits to be manufactured and tested under the supervision of Classification Society. The davits to be single arm hydraulic slewing type and lower the rafts on the water by gravity. The davits can be slewed by accumulator or manual pump driven in case of power failure.

Six (6) throw over type liferafts, each for 25 persons with hydraulic release devices, to be provided on main deck.

4.5.5 Life jackets and immersion suits

The life jackets (with self-lighting) and immersion suits to be provided on board in the living cabins. In addition, a specific number of lifejackets and immersion suits to be stowed at the suitable locations for the persons who will be on duty at the locations where their lifejackets and immersion suits are not readily accessible, such as control room, office and switchboard room.

Proper number of working lifejackets will be provided for the workers on main deck.

4.5.6 Life buoy

Ten (10) buoys to be provided on the Unit. The buoys to be stowed on the suitable steel brackets secured to the railings and/or wall. Of the ten buoys, two (2) to be provided with Ø8×40m life line, four (4) buoys with water light, two (2) with water light and smoke signal.

4.5.7 Other life-saving equipment

Other life-saving equipment to be equipped according to the relevant rules and regulations.

Twelve (12) rocket parachute signals to be provided in wheel house.

One (1) life line throwing apparatus to be provided in wheel house.

Two (2) embarkation ladders to be provided near the liferafts on main deck.

Six (6) two-way VHF radiotelephone apparatus and six (6) search and rescue locating devices to be provided for the lifeboats.

4.5.8 Helideck facility

The edges around the helideck to be fitted with a 1.5m wide safety net to protect personnel. The safety net to be galvanized wire PVC covered.

The helideck to be equipped with sisal antiskid net.

The helideck to have three exits and passages through three stairs with appropriate distance.

The helideck marking to be in compliance with IMO MODU Code. The helideck markings to include the boundary lines around the deck, target ring in the middle, "H" character, Unit's name.

The edges around the helideck to be fitted with water collecting duct.

One windsock with light to be provided for the helicopter parachutes.

4.6 Fire-fighting Equipment

The firefighting equipment to be supplied in accordance with "IMO Code for the Construction and Equipment of Mobile Offshore Drilling Units". All the portable extinguisher locations to be clearly marked and numbered. The extinguishers to be

mounted on the suitable brackets and to be located at fire stations where practicable.

Four (4) fireman's outfits to be provided, two of them to be located on main deck, the other two to be located near the helideck on 04 level. The fireman's outfits to meet the requirements of the "FSS code" and "IMO MODU Code".

The following rescue equipment in compliance with "MODU Code" to be provided in the fire toolbox near the helipdeck on 04 level:

Adjustable wrench;

Blanket, fire-resistant;

Cutters, bolt, 60cm;

Hook, grad or salving;

Hacksaw, heavy duty complete with 6 spare blades;

Ladder;

Lift line 5 mm diameter and 30 m in length;

Pliers, side-cutting;

Assorted screwdrivers;

Harness knife complete with sheath and crowbar.

PART 5 ACCOMMODATION

5.1 Accommodation Design Standard

The fire prevention of the Unit to meet the requirement of IMO MODU Code. Material of lining panel, lining bar and ceiling used in the living space, service space and machinery space to be fire-retardant.

5.2 Accommodation General Design

Accommodation suitable for 300 persons to be located in the superstructure and above the lower deck. The superstructure to have five floors. The accommodation to be arranged and fitted out in accordance with the General Arrangement plan.

Category of accommodation to refer to the following table.

Space	Room Name
Living space	1-man room(10),2-men room(19), 4-men room(63)
Public space	Mess, meeting room, office, lounge, prayer room, gymnasium, helicopter waiting room, library
Control space	Radio room, Wheel house, Jacking control room
Sanitary space	Change room, toilet
Service space	Galley, laundry, medical & ward room
Machinery space	CO ₂ room, emergency generator room, garbage treatment room, switchboard room, engine room, jack house, A.C. room, pump room, emergency fire fighting pump room, AHU room, , , rudder propeller room, bow thruster room
Store	Chiller, freezer, dry store, store, linen room, painting room
Passage	Corridor, stairway

5.2.1 Lower deck

The height of the lower deck to be 2800mm and the clear height to be abt. 2150mm. The lower deck to be arranged with galley, mess, chiller, freezer, AC. room, pump room, store and dry store,change room, switchboard room, laundry, gymnasium, toilet.The clear height of the corridor on lower deck to be abt.2100mm .

5.2.2 Main deck

The height of the main deck to be 3000mm and the clear height to be abt. 2300mm. The main deck to be arranged with 1- man rooms, 2-men rooms, 4-men rooms, linen rooms, toilet, office, medical& ward room and AHU room.

5.2.3 01 Deck level

The height of the 01 deck level to be 3000mm and the clear height to be abt. 2300mm. The 01 deck level to be arranged with 4-men rooms, 2-men rooms, library, office & meeting room, linen rooms lounge and AHU room.

5.2.4 02 Deck level

The height of the 02 deck level to be 3000mm and the clear height to be abt. 2300mm. The 02 deck level to be arranged with 4-men rooms, 2-men rooms, linen rooms, prayer room and AHU room.

5.2.5 03 Deck level

The height of the 03 deck level to be 3000mm and the clear height to be abt. 2300mm. The 03 deck level to be arranged with 1-man rooms, 2-men room, 4-men rooms, office, meeting room, helicopter waiting room, emergency generator room, linen rooms, AHU room, wheelhouse and radio room.

5.2.6 04 Deck level

The height of the 04 deck level to be 3000mm, and the clear height to be abt. 2300mm. The jacking control room to be arranged on 04 level.

5.3 Room Arrangement**5.3.2 Cabin arrangement**

1-man room (2 nos.)—— Main deck

Name	Size	Qty	Remark
Single bed	2000x900	1	Spring mattress
Sanitary		1	
Bed curtain		1	
Writing desk		1	
Chair		1	
Wardrobe	400X600X2100	1	
Coat hook		2	
Window curtain		1	
Desk light		1	
Book shelf		1	
Bed lamp		1	

1-Man Room (5 nos.)—— 03 deck level

Name	Size	Qty	Remark
Single bed	2000x1000	1	Spring mattress
Sanitary		1	

Bed curtain		1	
Writing desk		1	
Chair		1	
Wardrobe	400X600X2100	1	
Coat hook		2	
Window curtain		1	
Desk light		1	
Book shelf		1	
Bed lamp		1	
Bedstand		1	

1-Man Room (Room No. 523)—— 03 deck level

Name	Size	Qty	Remark
Single bed	2000x1400	1	Spring mattress
Sanitary		1	
Bed curtain		1	
Writing desk		1	
Chair		1	
Wardrobe	900 x600 x2100	1	
Coat hook		2	
Window curtain		2	
Safe		1	
Desk light		1	
Book shelf		1	
Bed lamp		1	
Sofa		1	
Tea table		1	
Bedstand		1	
File cabinet		1	

1-Man Room (Room No. 528)—— 03 deck level

Name	Size	Qty	Remark
Single bed	2000x1400	1	Spring mattress
Sanitary		1	
Bed curtain		1	
Writing desk		1	
Chair		1	
Wardrobe	900 x600 x2100	1	
Coat hook		2	
Window curtain		2	
Desk light		1	
Book shelf		1	
Bed lamp		1	
Sofa		1	

Tea table		1	
Bedstand		1	
File cabinet		1	
1-Man Room (Room No. 524)—— 03 deck level			
Name	Size	Qty	Remark
Single bed	2000x1400	1	Spring mattress
Sanitary		1	
Bed curtain		1	
Writing desk		1	
Chair		1	
Wardrobe	400 x600 x2100	1	
Coat hook		2	
Window curtain		1	
Desk light		1	
Book shelf		1	
Bed lamp		1	
Bedstand		1	
2-Men Room (19 nos.)			
Name	Size	Qty	Remark
Single bed		2	Spring mattress
Sanitary		1	
Bed curtain		2	
Writing desk		1	
Desk chair		1	
Wardrobe	400X600X2100	2	
Coat hook		4	
Window curtain		1	
Desk light		1	
Book shelf		2	
Bed lamp		2	
4-Men Room (63 nos.)			
Name	Size	Qty	Remark
Bed (2-tiers)		2	Spring mattress
Sanitary		1	
Bed curtain		4	
Writing desk		1	
Desk chair		1	
Wardrobe	400X600X2100	4	
Coat hook		8	
Desk light		1	

Book shelf		4	
Bed lamp		4	
5.3.3 Other function cabin arrangement			
Medical & ward room			
Name	Size	Qty	Remark
Single bed	2000X900	2	
Bed lamp		2	
Bed curtain		3	
Wardrobe	400x600x2100	2	
Bedstand		2	
Window curtain		2	
Sanitary		1	
Medicine locker		1	
Refrigerator		1	
Coat hook		8	
Writing desk		1	
Chair		1	
Diagnosis bed		1	
Medical cabinet		1	
Flap chair		1	
Book shelf		1	
Desk light		1	
Oxygen resuscitator		1	
Toilet (2 nos.)			
Name	Size	Qty	Remark
Water closet		5	
Bump box		5	Stainless
Wall-hang urinal		4	
Brush		5	
Waste basket		5	Stainless
Shower suit		2	Stainless
Bath curtain		2	
Wardrobe		2	Stainless, against water splash
Soap holder		4	
Storm rail		2	Stainless

Mirror		2	
Pedestal basin		2	
Flushing device		5	
Washing tank		2	
Change Rooms (2 nos.)			
Name	Size	Qty	Remark
Change locker	300X500X1800	148	2-tier
Fixed bench	1500X400X420	5	Steel framed structure
Mirror		3	With light
Pedestal basin		3	
Soap holder		3	
Office (Main deck)			
Name	Size	Qty	Remark
Desk	2200/5900/2200x750x780	1	
Chair		6	
Meeting table		1	
Office & meeting room (01 deck level)			
Name	Size	Qty	Remark
Computer table	1500/1450X500X780	3	
Chair		11	
File cabinet		2	
Meeting table		1	
Long stool	2400x450x450	2	
Long stool	3100x450x450	1	
Office (03 deck level)			
Name	Size	Qty	Remark
Computer table	1500/1450X500X780	4	
Chair		4	
File cabinet		2	
Coat hook		5	
Meeting room (03 deck level)			
Name	Size	Qty	Remark
Chair		10	
File cabinet		1	
Coat hook		10	
Window curtain		3	

Lounge (01 deck level)

Name	Size	Qty	Remark
Sofa		3	
Recreation table	800x800x750	2	
Recreation table	1200x600x750	3	
Book shelf		1	
TV		1	
Chair		8	
Coat hook		10	
Window curtain		4	

Helicopter waiting room

Name	Size	Qty	Remark
Drinking foundation		1	
TV		1	
File cabinet		1	
Writing desk		1	
Chair		1	
Desk light		1	
Tea table		1	
Sofa		1	
TV table		1	
Coat hook		4	
Window curtain		1	

Wheelhouse

Name	Size	Qty	Remark
File cabinet		1	
Chart table	1400X1000X900	1	
Chair		2	
Binocle box		1	
File/fire cabinet		1	
Flag cabinet		1	
Curtain		3	
Curtain		2	

Radio room

Name	Size	Qty	Remark
File cabinet		2	
Chair		1	
Curtain		1	

Jacking control room

Name	Size	Qty	Remark
File cabinet		1	
Window shade		9	
Chair		1	
Printer table		1	
Control panel table		1	

Linen room (7 nos.)

Name	Size	Qty	Remark
Shelving unit			

Corridor

Name	Size	Qty	Remark
Drinking fountain		9	

Mess room (No. 1 and No. 2)

Name	Size	Qty	Remark
Dinner table	2500X650X750	10	
Dinner table	1800X650X750	6	
Dinner table	3000X650X750	4	
Dinner table	φ2000	2	
Dinner beach	2450x250x420	20	
Dinner beach	1750x250x420	12	
Dinner beach	2950x250x420	8	
Dinner chair		20	
Pedestal basin		1	
Coat hook		10	
Heat preservation table	1800X650X850	2	
Pantry table	1000X500X1000	4	
Ele. water heater	450X515X1160	1	30L
Ice machine	650X750X890	1	220V,50Hz,582W,90kg/24h
Refrigerator		2	
Washing table	2200X550X800	1	
Garbage bin		3	with cover
Tea table		1	
Sofa		1	

Galley				
Name	Parameter	Size	Qty	Remark
Ele. range with 6 hotplates	380V, 50Hz, 27.6kW	1200X900X850	1	With baking oven
Flavoring table		500X1050X850	2	
Parching pot	380V, 50Hz, 9kW	1026X700X850	2	
Ele. range	380V, 50Hz, 15kW	900x900X800	1	
Hood		2800X1100X200/650	2	
Ele. bain-marie	380V, 50Hz, 11.8kW	1000X650X1820	1	
Tilting soup pan	380V, 50Hz, 13.5kW 120L	1125X790X920	1	
Waster disposer	380V, 50Hz, 1.5kW	φ380X840	1	
Work table		1400X500X820	2	
Work table		1400X650X850	1	
Work table		1700X800X850	2	
Garbage bin		φ400	2	
Ele. steam cooker	380V, 50Hz, 13.5kW	700X700X1900	1	
Pan cake toaster	380V, 50Hz, 4.5kW	600X750X980	1	
Universal cooking machine	380V, 50Hz, 0.75kW 50L	505X625X960	1	
Plate rack		600X300X600	2	
Washing table (2 sinks)		1500X600X850	2	
Ele. potato peeler	220V, 50Hz, 750W	407X586X1090	1	
Freezer	220V, 330W, 1000L	1220X760X1965	1	
Plate rack	1000x500x1800		3	
Dish washing	380V, 50Hz, 18kW	696X712X1400	2	
Refrigerator (cold store)	220V, 157W, 500L	680X760X1965	1	
Chopping block and shelf		600X600X700	1	
Channel steel				
Library				
Name	Size	Qty	Remark	
Chair		2		
Book shelf		6		
Sofa		1		
Recreation table		1		
Long stool		2		
Long table		1		
Coat hook		10		
Window curtain		2		

Laundry			
Name	Size	Qty	Remark
Washing machine	15kg	2	
Dryer	15kg	2	
Washing/dryer	7.5kg	11	
Dry clothes lines		1	
Iron table		1	With 1 hand iron
Locker	1300x500x1800	1	
Stainless wash basin	500x500	1	
Gymnasium			
Name	Size	Qty	Remark
Multi-functional fitness machine		1	
Treadmill running machine		1	
Bicycle fitness machine		2	
5.4 Accommodation Decoration			
5.4.1 General			
The cabin fire integrity of the Unit to meet IMO MODE Code and amendments. All lining panels, ceilings, thermal insulation materials and deck coverings used for living space, public space, service space and control space in superstructure to meet the requirements of fire division.			
5.4.2 Partitions and ceilings			
Description	Scope(lining panel and ceiling)		
25mm aluminum honeycomb panel and 30mm aluminum honeycomb ceiling	Living space, mess, prayer room, office, meeting room, ward, medical room, gymnasium, lounge, helicopter waiting room, jacking control room, corridor, stairway, switchboard room, linen rooms, library, radio room, wheel house		
25mm damp-proof aluminum honeycomb panel and 30mm aluminum honeycomb ceiling (stainless steel for visible side, only galley)	Change room, galley, toilet, laundry		
50mm rock wool panel	Partition		
Aluminium foil of insulation surface (exposed on surface)	Pump room, CO ₂ room, AHU room, A.C. room, bottom of switchboard room, rudder propeller room, engine room top		
Galvanized steel plate	Dry store, emergency generator room		

5.4.3 Insulation material

Location	Insulation
	Material & Thickness
A60 class bulkhead	2x20-mm ceramic wool + 2x20-mm ceramic wool blanket
A60 deck/roof	2x20-mm ceramic wool + 2x20-mm ceramic wool blanket
Thermal/ Acoustic insulation	75mm glass wool + 30mm glass wool blanket

Note:

- 1) When the deck and wall covered with fire insulation intersect at wall or deck, the fire insulation to be extended to 450mm.
- 2) Insulation to be clung to the deck or wall tightly.
- 3) Insulation surface (exposed one surface) to be covered with aluminium foil and to be secured by pin and washer.

The A60 fire-rated insulations to be Class approved for the intended fire rating. The A60 ceramic wool to be minimum 170kg/m³ in density, minimum 2x20-mm thick on bulkhead plates, 2x20-mm thick on deck/roof plate and 2x20-mm thick on stiffeners.

The glass wool to be minimum 60kg/m³ in density, 75mm thick and 30mm thick on stiffeners.

5.5 Deck Covering

The steel decks to be thoroughly cleaned and mastic coated before the installation of deck coverings. Schedule of the deck coverings to be as the following table:

Location	Floor Finish
1-man, 2-men, 4-men, mess, prayer room, corridor, office, Lounge, helicopter waiting room, meeting room, stairway, medic & ward and dry store, gymnasium, library	9mm Primary deck covering + 2mm leveling deck covering + 2mm PVC
Step of inner ladders	3mm round particles series (rubber)
Switchboard room, jacking control room, wheelhouse, radio room, emergency generator room	9mm primary deck covering + 2mm leveling deck covering + 3mm rubber flooring
Galley, laundry, toilet and change room	40-mm Screed underlayment (cement + sandstone) + 10mm anti-friction ceramic tiles
Store, pump room (on lower deck), painting room, CO ₂ room, linen room, A.C. room, AHU room, workshop	Epoxy paint on steel deck

5.6 Door and Window

5.6.1 Door

Name	Type	Clear width (mm)	Location
Quick open & close steel watertight door	wheel type	750~800	Watertight wall
“A” class Quick open & close steel weathertight door	“A0” class Single handle type	750~800	Wall of superstructure
Fire door	“A” class fire door	750~800	“A” class bulkhead
	“B” class fire door	650~800	“B” class bulkhead

Note:

- 1) System lock and closer to be provided for steel weathertight doors.
- 2) System lock and closer is to be provided for “A” fire doors, and system lock is to be provided for “B” fire doors.

5.6.2 Window

Name	Clear size (mm)	Type	Location
Rectangular window	450x630	Fixed	Main deck (windows with cover), 01 deck level, 02 deck level and 03 deck level
Wheelhouse window	1400x1000	Fixed	Wheelhouse
Wheelhouse window	818/1048x1000	Fixed	Wheelhouse
Radio room window	1200x1000	Fixed	Radio room
Wheelhouse window	1100x1100	Fixed	Jacking control room
A0 class fire service window	1400x900	Rolling window	Galley
A0 class fire service window	850x900	Rolling window	Galley
A0 class fire	900x630	Fixed	Switchboard room

Note: 1) Window glass is to be toughened glass, glass thickness meet requirement of ISO.

2) All windows are to be welding type.

PART 6 OUTFITS AND PASSAGEWAY ARRANGEMENT

6.1 General

The outfits and passageway arrangement to meet the requirements of the Classification Society to ensure the outfits will have no influence to the passageway and enough operation area will be remained.

6.2 Man Hole Cover

The manhole covers (clear opening not less than 800x600mm) to be provided for the access to oil tanks, fresh water tanks, ballast water tanks, void spaces and where is necessary. Manhole covers to be secured with stainless steel studs and nuts. Each manhole cover to be marked with the name of the compartment by welding bead.

6.3 Hatch Cover

The weathertight small hatch covers on weather deck to be used for an access for the tank which to be regularly accessed. The small hatch used for the escape access to be the quick opening type which can open from both sides. The coaming height of the small hatch covers on the main deck to be no less than 600mm.

The watertight small hatch cover used for emergency fire fighting pump room to be fitted on lower deck, and the coaming height of such small hatch cover to be 250mm.

The clear opening of the small hatch covers to be 800 x 800 mm generally, except the follows:

The jackhouse top to be 600x600mm;

One (1) flush type hatch cover of engine room to be fitted on main deck with 1800 x 1200 mm clear opening.

Two (2) flush type hatch cover of rudder propeller rooms to be fitted on main deck, each with Ø3730 mm clear opening.

6.4 Inclined Ladder and Vertical Ladder

In general, the ladders to be fitted as shown on the General Arrangement Plan.

6.4.1 Inclined ladder

The angle between the stairs in accommodation area and the horizontal to be not larger than 50° and the width of the stair to be no less than 700mm. The step of the steel stairs on weather deck to be grating and the stairs to be fitted with handrail on both sides.

6.4.2 Vertical ladder

The steel ladder to be arranged for tanks, decks and where is necessary. The ladder to be not less than 350mm in width, the material of the steps to be 22mm×22mm square bar, the step and the frame to be welded on both side.

6.5 Handrail

6.5.1 Handrail

Handrails to be installed on the periphery of the weather deck, superstructure top, deckhouse and where is necessary. The handrail to be provided with top rail, mid rail and lower rail. The height of the top rail to be approx. 1000mm above deck. The stanchions to be provided at the intervals of approx. 1200mm.

6.5.2 Storm rail

The storm rails to be fitted on the exposed wall of the deckhouse where the people frequently walk. The storm rail on the exposed area to be galvanized and painted, the storm rails to be fitted at approx. 1000mm above the deck.

The storm rails in the accommodation to be provided at one side of the corridor at 1000mm height above the deck. Handrail material to be of stainless steel pipe.

6.6 Gratings and Floor Plates

The exposed galvanized steel gratings to be installed where is necessary. The chequered plates to be provided in the engine room and where is necessary for convenient access and operation of all the equipment.

6.7 Drain Plugs

Each ballast tank, fresh water tank and the seawater reservoir to be fitted with one (1) drain plug. Each plug to be accessible from outside of the tanks. The material of the plugs to be stainless steel.

6.8 Escape Route

The safe escape routes without any obstruction to be provided where will be regularly accessed. The design of the escape routes to meet the requirements of Class rules and be approved by the Class.

PART 7 AIR-CONDITIONERS, VENTILATION AND REFRIGERATION

7.1 Air Conditioning System

7.1.1 General

The air conditioning system to be designed for max. 60% return air, however, the air supply and exhaust of the accommodation should be in balance during the most extreme environmental conditions.

The air conditioning system to be designed to meet the following conditions:

- The max. outdoor ambient temperature, design condition: 50°C, 85% RH
- The max. indoor ambient temperature, design condition: 25°C, 50%RH
- The max. seawater temperature, design condition: 36°C

In the indirect air handling unit, the outside fresh air and the re-circulated air can be mixed, filtered, cooled, and pressed to the single duct system through a centrifugal fan. The single duct supplies air to the living quarter, offices, messes, medical room & ward, etc.

Air change rate shall be around six (6) times/hour for cabins and eight (8) times/hour for public spaces. Final air change rate, however, shall be determined according to the rules and above environmental condition.

7.1.2 Central air conditioners

Two (2) sea water cooled chiller units to be arranged in the engine room. The air supplied to leave the cabins via a split under the cabin door, and come in recirculation via the corridor and the recirculation duct to the air conditioning plant, or leave the accommodation either by the exhaust sanitary spaces or via the overflow.

The system of air conditioning to consist of:

- Two (2) sea water cooled chiller units. (2X66%)
- Two (2) marine indirect air handling unit on lower deck
- One (1) marine indirect air handling unit on main deck
- One (1) marine indirect air handling unit on 01 level
- One (1) marine indirect air handling unit on 02 level
- One (1) marine indirect air handling unit on 03 level
- A pre-insulated single duct pipe system;
- Fire dampers;
- Cabin units with sound absorber;

Each sea water cooled chiller unit to consist of:

- Four (4) Compressors (having 25% of required capacity)

- One (1) Sea water cooled condenser (having 100% of required capacity)
- One (1) Evaporator

Each marine indirect air handling unit to consist of:

- A mixing box
- Frozen water cooled condenser 1 set (having 100% of required capacity)
- Air filter section 1 set
- Fan section
- Stainless steel drain pan with water trap 1set
- Control panel 1 set

The capacity of marine indirect air handling unit to satisfy the peak load of the AC spaces where it serves.

The multi-level control to be used to make sure that the system can work normally even if in high temperature environment.

All the equipment and materials used to be appropriate for marine environment.

The main technical parameters of the air-conditioning to be as follows:

1) Sea water cooled chiller unit

Model: 30HXC-310
 Number: 2 sets (2X66%)
 Cooling capacity: 1000kW
 Compressor motor: 270kW
 Cooling water flow: 220m³/h
 Frozen water flow: 175m³/h
 Power supply: 380V 50Hz

2) Indirect air handling unit for lower deck (AHU-01)

Number: 1 set
 Cooling capacity: 305kW
 Air flow: 10000m³/h
 Frozen water flow: 52m³/h
 External static pressure: 1800Pa
 Fan motor: 10kW
 Power supply: 380V 50Hz

3) Indirect air handling unit for main deck (AHU-02)

Number: 1 set
 Cooling capacity: 175kW

Air flow: 5200m³/h
Frozen water flow: 30m³/h
External static pressure: 1500Pa
Fan motor: 5.5kW
Power supply: 380V 50Hz

4) Indirect air handling unit for 01 level (AHU-03)

Number: 1 set
Cooling capacity: 290kW
Air flow: 9600m³/h
Frozen water flow: 52m³/h
External static pressure: 1500Pa
Fan motor: 10.5kW
Power supply: 380V 50Hz

5) Indirect air handling unit for 02 level (AHU-04)

Number: 1 set
Cooling capacity: 260kW
Air flow: 9100m³/h
Frozen water flow: 45m³/h
External static pressure: 1500Pa
Fan motor: 10.5kW
Power supply: 380V 50Hz

6) Indirect air handling unit for 03 level (AHU-05)

Number: 1 set
Cooling capacity: 260kW
Air flow: 9000m³/h
Frozen water flow: 45m³/h
External static pressure: 1500Pa
Fan motor: 10.5kW
Power supply: 380V 50Hz

7) Indirect air handling unit for Galley (AHU-06)

Number: 1 set
Cooling capacity: 93kW
Air flow: 1500m³/h
Frozen water flow: 16m³/h

External static pressure: 1500Pa
 Fan motor: 5.5kW
 Power supply: 380V 50Hz

7.1.3 Separate air conditioner

1) Switchboard room air conditioner
 One floor mounted air-conditioner to be provided in switchboard room. The unit to mainly include the compressor, condenser, direct evaporator and fan.

Main technical parameters:

Model: CL-20B
 Number: 1 set
 Cooling capacity: 23.3kW
 Fan motor: 0.75W
 Compressor motor: 5.5kW
 Cooling water flow: 6.5m³/h

2) Jacking control room air conditioner
 One marine air cooled spilt air conditioner to be provided in jacking control room. The marine air cooled spilt air conditioner is the cooling device, which can condition the air in chamber directly and composed by one marine air cooled condensing unit and all kinds of air handling units. The unit to have the features of new-design, easy-operation, stable-working, safety and convenient maintaining.

Main technical parameters:

Model: CFK (F)-25
 Number: 1 set
 Cooling capacity: 25kW
 Fan motor: 0.5kW
 Compressor motor: 7kW
 Cooling Fan of outdoor unit air flow: 13000m³/h
 Power supply: 380V 50Hz

7.2 Ventilation System

7.2.1 General

The minimum requirement for ventilation air volume, i.e., the rate of air changes per hour to be as the following table:

Table 1 Air changes per Hour

Space	Air Exchange Number per hour		Remark
	Mechanical Supply (MS)	Mechanical Exhaust (ME)	
Engine Room	40	Natural	
Galley	20	40	
Switchboard Room	12	Natural	
CO ₂ Room	Natural	15	
AC Room	Natural	20	
Pump Room	Natural	30	
Toilet	Natural	15	
WC Unit	Natural	10	
Medical & Ward Room	AC	12	
Laundry	AC	15	
Mess	AC	20	
Office	AC	12	

The engine room to be provided with supply fan (Reversible). The medical and ward room, toilet, office, meeting room, laundry, mess, AC room, CO₂ room, pump room and galley to be provided with exhaust fan. The volume of the fan to meet the requirement of the room.

7.2.2 Fans

The impeller of the fans to be made of anti-corrosive aluminum alloy while the housing is welded by the common steel.

7.2.3 Air Intakes and outlets

The rat proof net to be mounted on each air intake and outlet to prevent rats.

7.2.4 Duct

All indoor ducts to be fabricated by galvanized steel plate. All outdoor ducts to be sealed by welding steel plate.

The flanges of ducts to be assembled with rubber gaskets to prevent leakage.

The duct to be rigidly supported by metal hangers, straps, lugs or brackets with a maximum spacing of 1.5~2.5 m. The hangers to be galvanized to prevent corrosion.

7.3 Fire Dampers

The fire dampers to be designed and fabricated according to the rules.

The fire dampers to be arranged and installed in the supply/exhaust air ducts passing through the fire wall. The details refer to relative HVAC layout drawings.

The fire grade of the fire dampers to be the same as that of the bulkhead or the deck. All the fire dampers can be operated both pneumatically and manually, and can be automatically closed when the temperature of the fuse located inside the damper beyond $70\pm 3^{\circ}\text{C}$ and ESD shutdown signal to be sent from ESD system.

7.4 Refrigeration

7.4.1 General

The detailed design and the refrigeration calculation to be made on the refrigerator and equipment which are intended to provide food for 300 persons for 15 days continuously according to the refrigeration system (chiller 4°C , freezer -20°C , dry store 20°C), and supply direct expansion type refrigeration system with R404a or other refrigerant approved by Owner and in compliance with environment protection requirements.

All the equipment to be designed to run and control automatically and supplied in a way of combined skid type unit with refrigerant pipes which are filled with refrigerant after being installed, cleaned and leakage tested and vacuumized.

7.4.2 Equipment

Two (2) sets of refrigeration compressor units (one as standby), with cooling capacity of 17.5kW, of automatically control seawater cooling type, with three-level unloading/loading function, to be provided and installed as per the relevant drawings. The cooling capacity of each unit to be determined based on the storage capacity by Builder. When the temperature is 50°C outdoor, the unit to be able to reduce the temperature in the store to the design value after running for 22 hours or in 24 hours after the food is put into the refrigerator. The units to be accompanied with pre-connected control panel, power supply connection piece, circuit breaker, control transformer, de-frost timer, connection bar, starter, high/low voltage switch and automatic starter of motor. The units to be provided with pressure gauge isolating valve and refrigerant level gauge.

Refrigerator to be arranged according to the location and size as indicated in the relevant drawings. Store temperature and cooling system to refer to Table 2

Table 2 – cooling requirements		
Name	Design temp $^{\circ}\text{C}$	Cooling system
Chiller (vegetable store)	4	Evaporator to have fan, and drain pipe
Freezer (meat/fish store)	-20	Evaporator to have fan, defrost heater and drain pipe heater
Dry store	20	Evaporator shall have fan, and drain pipe

Condenser to be provided with air relief valves.

7.4.3 Auxiliary equipment

1) Air cooler

Air cooler (evaporator fan) to be of assembled type, which can be driven directly and protected by protection devices. Evaporator to be provided with copper alloy pipes and fans which are painted with epoxy coating in accordance with the requirements of the administrative authorities.

2) Defrost of freezer to be made automatically through the electrical heating elements in evaporator and condensate trays.

3) Shelves and other equipment

Adjustable three layer S.S shelf to be arranged in freezer and chiller. Each refrigerator to be provided with ceiling lamp with switches outside and one deck scupper of 75mm diameter with movable wooden plug.

4) Each refrigerator to be arranged with one refrigerator door alarm button, whose signals are transferred to wheelhouse console and galley.

PART 8 ENGINE ROOM EQUIPMENT

8.1 Layout of the Main Equipment Rooms

8.1.1 Engine room

The engine room to be located in the aft part of the hull, stern of which is adjacent to rudder propeller room and the fore part of which is adjacent to accommodation. Each one access on both portside and starboard to the open deck to be arranged. The switchboard room to be arranged at the fore part of engine room. Two (2) main engines and Five (5) main generator sets and other auxiliary equipment, such as chiller units, chiller water pumps, bilge pumps, fire pump, ballast pump, cooling pumps, fresh water makers and hydraulic power units, to be arranged in the engine room.

8.1.2 Emergency generator room

The emergency generator room to be located on the 03 Level. The emergency generator to be provided with dual starting system, which shall satisfy the requirements of the Class Rules.

The emergency generator to be used for emergency operating condition. When the main power fails, it can be auto-started and then supply power within 45s.

8.1.3 Workshop

Workshop to be arranged on the main deck adjacent to the port access leading to engine room. Some workshop equipment to be supplied, such as one (1) lathe, one (1) driller, one (1) grinder, one (1) working table with vice and tool shelter.

8.2 Power Station and Propulsion system

8.2.1 Main power station

The main power station of the Unit to consist of five (5) main generator sets (four for operation and one for standby). It should meet the requirements that four (4) generator sets are operating in parallel while the load of each five (5) sets can be transferred to the others.

8.2.2 Main diesel generator set

8.2.2.1 Main specification parameter of main diesel generating set

Quantity:	five (5) sets
Output power:	450 kW
Voltage:	AC400V

Number of phases: 3
Frequency: 50Hz
Power factor: 0.8

8.2.2.2 Engine specification

Type: in-line, 6 cylinders, 4 strokes, turbo charging, inter-cooling
Output power: abt.492 kW
Rated speed of diesel engine: 1500 r/min
Fuel oil consumption: 122.5 L/h +/-5%
Lubricating oil consumption: 1g/kW*h wet sump
Starting method: Compressed air starting
Cooling method: Sea water cooling
Emissions: IMO compliant (TIERII)

8.2.2.3 Generator specification

Generator type: AC three-phase, brushless, synchronous
Rated power: 450kW
Rotational speed: 1500rpm
Voltage: 400V
Number of phase: 3
Frequency: 50Hz
Power factor: 0.8
Protection level: IP23
Class of insulation: H

8.2.3 Emergency power station

8.2.3.1 Specification parameters of emergency diesel generator set

Type: in-line, 6 cylinders, 4 strokes, turbo charging, inter-cooling
Quantity: One (1) set
Output power: 250kW
Voltage: AC400V
Number of phase: 3
Frequency: 50Hz
Power factor: 0.8
Start-up: 24V D.C battery and Manual accumulator
Cooling method: Wind cooling

Dead ship recovery procedure to be as following:

- 1) Starting emergency generator by either manual accumulator or electrical battery.
- 2) One of air compressors to be started by emergency power supply.
- 3) Main generator to be started by compressed air.

8.2.4 Propulsion system and thruster

The propulsion system to be consist of two (2) four stroke, turbocharged diesel engines and two (2) rudder propellers.

One (1) bow thruster to be installed in the fore of the Unit.

The propulsion system and bow thruster can be remotely controlled from wheelhouse, and be controlled locally.

8.2.4.1 Main Engine

Type:	V-16 cylinders, 4 strokes, turbo charging, inter-cooling, single cylinder injection pump
Quantity:	Two (2) sets
Model:	CW16V200ZC
M.C.R:	1760kW
Rated speed:	1000r/min
Cylinder bore:	200 mm.
Stroke:	270 mm.
Fuel oil consumption:	197 L/h +/-5%
Lubricating oil consumption:	1g/kW*h wet sump
Starting method:	Compressed air starting
Cooling method:	Sea water
Cyl. jacket cooling:	Fresh water
Emissions:	IMO compliant (TIERII)

8.2.4.2 Rudder propeller

QTY:	Two (2) nos.
Input power max:	1600kW
Input speed:	1000r/min

8.2.4.3 Bow Thruster

Propeller blade diameter:	1500mm
No. of propeller blades:	4
Calculated thrust:	approx. 80kN
Drive motor type:	Electric AC motor

Drive motor power: approx. 600kW
 Drive motor shaft speed: approx. 1485r/min
 Protection: IP44

8.3 Auxiliary Equipment

8.3.1 Air compressor and receiver

8.3.1.1 Air compressor unit

Two (2) skidded mounted compressor units with auto starting to be provided in the engine room.

Rated capacity: 18.5m³/h, 3.0MPa.

The units to be wind cooling type.

8.3.1.2 Air dryer

One (1) air dryer of cold type to be provided.

Rated capacity: 6m³/h @1.0MPa

8.3.1.3 Air receivers

The Unit to be equipped with two (2) main air receivers and one (1) service air receiver.

The air receivers to be in compliance with the requirements of the Classification Society.

The air receivers to be equipped with safety valve.

Main air receiver: 0.32m³/3.0MPa

Service air receiver: 0.16m³/1.0MPa

8.3.2 Fuel oil purifier

One (1) self-discharging fuel oil purifier with capacity of 2000L/h to be provided in the engine room.

8.3.3 Oily water separator

One (1) oily water separator to be mounted in the engine room with the capacity of 0.5m³/h. The oil content of the discharge is not more than 15ppm.

8.3.4 Pump

The theoretical specification of the pumps to be listed in the following table:

Item	Name	Qty.	Type	Parameter	Material	Remark
1	Fuel oil transfer pump	2	Gear pump	8m ³ /h @ 0.35MPa	Casing: Cast Iron Impeller: Steel Shaft: Steel	
2	Lub.oil pump	1	Hand pump	2.88m ³ /h @ 0.245MPa	Casing: Cast Al. Shaft: St. Steel	
3	Dirty oil pump	1	Horizontal single screw pump	2.28m ³ /h @ 0.4MPa	casing: Cast Iron Shaft: St. Steel	
4	Bilge pump	2	Vertical	80m ³ /h @	Casing: Cast bronze	

			centrifugal pump	0.32MPa	Impeller: Bronze Shaft: St. Steel	
5	Ballast general service Pump	1	Vertical centrifugal pump	250m ³ /h @ 0.4MPa	Casing: Cast bronze Impeller: Bronze Shaft: St. Steel	
6	Jetting pump	1	Horizontal centrifugal pump	40m ³ /h @ 6.0MPa	Casing: Cast bronze Impeller: Bronze Shaft: St. Steel	
7	Submersible pump	3		400m ³ /h @ 0.67MPa	Casing: 316L Impeller: Bronze Shaft: 316L	
8	Fire general service pump	1	Vertical centrifugal pump	250m ³ /h @ 0.4MPa 140m ³ /h @ 0.8MPa	Casing: Cast bronze Impeller: Bronze Shaft: St. Steel	
9	Fire fighting pump	1	Vertical centrifugal pump	100m ³ /h @ 0.6MPa	Casing: Cast bronze Impeller: Bronze Shaft: St. Steel	
10	Foam pump	1	Vertical centrifugal pump	140m ³ /h @ 1.0MPa	Casing: Cast bronze Impeller: Bronze Shaft: St. Steel	
11	S.W Cooling pump	1	Vertical centrifugal pump	250 m ³ /h @ 0.4MPa	Casing: Cast bronze Impeller: Bronze Shaft: St. Steel	

8.3.5 Hose reel system for submersible pump

Three (3) hose reels system to be provided for lifting and lowering the submersible pump.

8.3.6 Domestic water equipment

8.3.6.1 F.W. pressure Tank

The two (2) F.W. pressure tanks to be skid mounted and be provided with two (2) pumps.

The capacity of the F.W. pressure tank to be 1.0m³/0.4MPa

8.3.6.2 Electric heating Tank

The two (2) electric heating tanks to be skid mounted and be provided with one (1) pump.

The capacity of the electric heating tank: 700L, 60kW

8.3.6.3 Fresh water maker

Two (2) fresh water makers to be provided, and the parameter to be as follows:

Type : Reverse osmotic seawater desalt plant

Average capacity: 40m³/d

Salt content: <700mg/L

8.3.6.4 Sewage treatment plants

Two (2) identical sewage treatment plants to be provided. The two sewage treatment plants to have a combined capacity suitable for 300 men, grey and black water.

Model : ST-100U

Type : Biological

Average capacity : 11m³/d

8.3.7 Repair equipment

- | | |
|---------------------------------|---------|
| 1) Lathe | One (1) |
| Length (max) of the work piece: | 460mm |
| 2) Driller | One (1) |
| Max. Drilling hole (max): | ø12.7mm |
| 3) Grinder | One (1) |
| Dia. of grinder (max): | ø200mm |
| 4) Working table with vice | One (1) |
| 5) Steel shelf for storage | |

8.3.8 Machinery lifting equipment

Eye pads with enough load capacity to be installed above the main machinery of 50kg and more such as diesel engine, air compressor, pump and generator.

A rail with a 1 ton hand hoist to be installed above each main engine and provided for workshop.

A rail with a 0.5 ton hand hoist to be installed above each main diesel generator.

8.3.9 Tank

The tanks to be fabricated in accordance with the Regulatory Body requirements and/or the manufacturer's recommendations for proper operation in the system they serve.

Main Tank Sheet of Engine System

No.	Name	Cap. (m ³)	Qty.
1	Fuel oil store tank 1	148.77	1
2	Fuel oil store tank 2	233.78	1
3	Fuel oil day tank 1	21.25	1
4	Fuel oil day tank 2	21.25	1
5	Seawater reservoir	322.69	1
6	Dirty oil tank	12.77	1
7	Bilge water tank	12.77	1
8	Fresh water tank 1	456.72	1
9	Fresh water tank 2	527.88	1
10	Emergency F.O. Tank	2.61	1
11	Emergency sewage water tank.	51.84	1

PART 9 MAIN PIPING SYSTEM

The piping system, including the pipes, valves and fittings are to be fitted and tested according to ABS requirements. All pipes are to be arranged according to the construction method in compliance with the Classification's requirements. The pipe thickness to be suitable for the intended purpose.

The piping systems are to be in accordance with the basic design and detailed design drawings approved by ABS. The material specification to be supplied by the manufacturer according to GB, CB, CMB and Class standards. The WPS, production plan, painting and color code to be as per the Builder's practice and Class requirements.

The welding of the galvanized pipes, if any, to be repaired with zinc-rich paint.
Corrosion protection:

F.O./L.O./Hydraulic oil/Compressed air pipe: acid pickling & phosphorization

S.W./sewage pipe: hot-dipped-galvanized

Main engine cooling F.W. pipe: acid pickling & phosphorization

The L.O. and hydraulic oil pipes to be flushed by oil circulating.

9.1 Fuel Oil System

The fuel oil system to mainly include the following tanks:

Name	Cap. (m ³)	Qty.
Fuel oil store tank 1	148.77	1
Fuel oil store tank 2	233.78	1
Fuel oil day tank 1	21.25	1
Fuel oil day tank 2	21.25	1
Dirty oil tank	12.77	1
Emergency F.O. Tank	2.61	1

9.1.1 Fuel oil filling / transfer and drain system

Diesel oil to be filled into two F.O. store tanks from the filling station on main deck. Filling manifold to be provided with safety valve, and discharged into F.O. store tank. High and low level alarm to be provided for F.O. store tanks.

The two (2) F.O. transfer pump to be used as standby for each other.

F.O. transfer pump to take suction from F.O. store tanks, and discharge to F.O. day tanks, emergency F.O. tank and crane F.O. tank.

Low and high suction to be arranged for F.O. store tanks.

Overflow pipe of F.O. day tanks to be led to the F.O. store tank.

Oil coaming to be arranged below the valves of the tanks and the drain from oil coaming to be led to dirty oil tank except the emergency F.O. tank drain.

9.1.2 Fuel purification piping system

One (1) fuel oil purifier to be provided. Fuel oil in F.O. store tanks to be led to purifier which will discharge the clean oil to F.O. day tanks.

Water and sludge separated from fuel oil to be led to dirty oil tank.

9.1.3 Fuel oil service system

Fuel oil system for main engine, main generator engine and emergency generator engine to be designed according to the manufacturer's standards.

The fuel oil from F.O. day tanks to be supplied for main engines and main generators .

Duplex type strainer to be fitted in the fuel oil supply line.

The pre-supply hand pump to be provided for main engine.

F.O. return pipe to be led to F.O. day tanks or emergency F.O. tank.

High and low level alarm to be provided for F.O. day tanks and emergency F.O. tank.

9.1.4 Fuel oil quick closed system

Fuel oil system equipment (such as transfer pump, oil purifier) to be provided with emergency shutdown outside of engine room.

The outlet of F.O. day tanks and F.O. store tanks to be provided with pneumatic quick closed valve. The outlet of emergency F.O. tank to be provided with manual quick closed valve. Quick closed valve to be operated outside of engine room or emergency generator room.

9.2 Lubricating Oil and Dirty Oil System

The lubricating oil system to mainly include the following tank:

Name	Qty.	Cap. (m ³)
L.O. Storage Tank	1	0.45

The Lub. oil system to comprise filling, transfer and drain system.

The Lub. oil to be filled into Lub. oil tanks from the filling station on main deck.

The Lub. oil to be transferred to main engines and main generator engines by hand pump.

The drain from engines to be led to dirty oil tank.

9.3 Diesel Engine Exhausting System

Exhaust gas pipes to be made of seamless steel pipe or welded steel pipe and fitted with bellows type expansion joint of stainless steel and silencer.

The separate exhaust gas pipe from engines to be individually led to the atmosphere.

The thermometer to be fitted at the outlet of engine exhaust gas pipes.

The exhaust pipes to be covered with insulation material which is fixed by steel wire, and further covered with galvanized steel sheet. The drain valve to be fitted at the lowest point of the exhaust pipes.

9.4 Compressed Air System

Two (2) air compressors to be provided according to the rules.

The air compressors can start and stop automatically according to the pressure of main air reservoirs.

The compressed air to be provided for various services with following pressure:

3.0MPa:	Main engine starting Main generator starting
1.0MPa:	M/E safety system
0.7MPa:	Level remote gauging system Control air service
0.4MPa:	Engine room general service Deck service Pressure tank Sea chests blow

9.5 Cooling System

The design should meet the requirements of Classification, regulatory bodies and manufactory recommendation.

The system to consist of three (3) submersible pumps, one (1) S.W. cooling pump, one (1) fire G/S pump, one (1) ballast G/S pump and two (2) sea chests.

When the Unit is under floating condition, the cooling S.W. to be supplied to the Unit by the S.W. cooling pumps and ballast general service pump via sea chests, the fire general service pump to be as standby.

When the Unit is under jacking and elevated condition, the cooling S.W. to be supplied by the two (2) submersible pumps, and the third one to be as standby. The pump working conditions should meet the operating requirement that the maximum air gap is up to 20m. One (1) marine growth prevention system of ionizing electrode, Cu/Al anode type to be fitted in each main sea water strainer.

9.6 Ballast System

The ballast system to be designed according to the Class requirements.

The ballast general service pump and fire general service pump to be provided for ballast

system.

The ballast system can fill up or empty any ballast tank. When the Unit is elevated, the ballast water to be supplied by the submersible pumps. When the Unit floats, the ballast water to be supplied by the ballast general service pump and fire general service pump. The suctions of ballast tanks to be arranged as low as practical to guarantee all the tanks can be emptied as far as possible.

The ballast discharge valves to be installed on the bottom of ballast tanks for discharging overboard directly. The ballast discharge valves to be closed in normal condition.

9.7 Bilge System

The bilge system to be provided in accordance with the requirements of the Classification Society and regulatory bodies.

Two (2) bilge pumps to be provided for the bilge system, and standby with each other.

The stop check valve and mud box or strainer to be fitted in the branch of system.

The bilge water to be discharged overboard after being separated, or to shore by the international shore connection.

One (1) S.W. cooling pump to be provided with emergency bilge suction fitted with the valve whose spindle extending at least 460mm above the floor plate.

High level bilge alarm to be provided for bilge water tank, bilge well in engine room and where is necessary, and displayed in switchboard room.

9.8 Firefighting System

The fire fighting system to be provided in accordance with the requirements of the Classification Society and regulatory bodies.

The fire fighting system to be provided as follows:

Engine room: Fixed CO₂ system
 Sea water from fire main

Portable fire extinguishers

Accommodation: Sea water from fire main
 Sea water sprinkler system
 Portable fire extinguishers

Galley: Fixed CO₂ system for exhaust ducts from galley range
 Portable fire extinguishers

Paint room: Fixed CO₂ system

9.8.1 Water fire fighting system

The fire general service pump and fire pump to be used for fire fighting, and take suction from sea water main pipe, one water reservoir tank or emergency sea chest.

The fire main line to be connected with fire general service pump and fire pump; two (2) isolation valves to be provided on the fire main at accommodation front.

The fire hydrant to be of DN 50mm.

One (1) portable international shore connection to be supplied.

The fire hose reel and nozzle shall be stored in the boxes adjacent to the hydrants, with the fixed identification marks according to Class requirements.

9.8.2 Foam extinguishing system

Foam extinguishing system to be provided on the helideck. Foam extinguishing system to consist of the foam pump, foam liquid storage tank (including foam concentration device) and foam monitor.

Foam pump and foam liquid storage tank to be arranged in the emergency fire fighting pump room.

9.9 Potable Water System

The potable water system to supply hot water and fresh water for drinking, cooking and washing.

The F.W. pressure tanks to supply the potable water for cooking and drinking water machine via the disinfection device.

The unsterilized cold water shall be supplied to washing, main engines and other equipment which are necessary.

The hot water system to be designed to have circulating system between accommodation and electric heating tank. The hot water pipe to be fitted with the thermal insulation layer according to the requirements, except the plastic pipe.

For easy maintenance and repair, stop valves to be provided on main line of the fresh water and hot water on each level.

Two (2) fresh water makers to be provided for daily fresh water compensation, and each capacity to be 40m³/day.

9.10 Sanitary Water System

The sanitary water to be supplied by S.W. main and flow to wash the toilet in accommodation.

9.11 Sewage System

Sewage system in accommodation spaces to be arranged separately as follows:

Black water: Drainage from water closet in each toilet, and all drainage from medical and ward room.

Grey water: Drainage from wash basins, sinks, scuppers, etc.

The drainage lines to be arranged in such way that the black water can be discharged to the sewage treatment plants or the emergency sewage water tank, and the grey water can be discharged overboard directly or discharge to the emergency sewage water tank.

Scuppers to be fitted in all public toilets, laundry, galley, and other space where water might be collected.

One (1) shore connection to be provided for sewage.

9.12 Deck Drainage System

9.12.1 Weather deck drainage

The scuppers or drainage arrangement to be arranged on all the exposed weather decks in accordance with the Builder's practice.

Deck drainage to be led to overboard directly or bilge water tank.

The exposed weather deck of the accommodation shall be drained subsequently to lower deck and a strike plate to be provided in general.

9.12.2 Helicopter deck drainage

The helicopter deck drainage to be provided in accordance with the requirements of the Classification Society and regulatory bodies.

Helicopter deck drainage shall be led to overboard independently or to the spill tank.

9.13 Leg Jetting System

The jetting system to be arranged to reduce the friction when pulling out the legs. Four (4) nozzles to be installed at the bottom of each spud can. Each leg to be fitted with one DN 80mm pipe with working pressure of 6.0Mpa and one joint at every 6 meters to guarantee jetting is feasible at any height.

One (1) jetting pumps to be arranged in the engine room.

In case of low pressure, the jetting pump can be replaced by the fire general service pump.

The pipes of jetting system to be led to the stop valve at the vicinity of the legs and then connected with the leg joint by hose.

9.14 Level Remote Detection System

The system to include:

Fresh water tank liquid level detection x2

Fuel oil tank liquid level detection x4

Ballast tank liquid level detection x11

Sea water reservoir tank liquid level detection x1

The pressure sensor to be provided for the fresh water tank and fuel oil tank. The indication of remote detection system to be arranged in switchboard room and wheelhouse.

9.15 Air Vent, Sounding and Filling System

The system to be provided in accordance with the requirements of the Classification Society and regulatory bodies.

The air pipes shall be fitted to the ballast tanks, fuel oil tanks, Lub. oil tanks and void spaces.

Vent head of air pipe shall be with class type approval certificate, stainless steel or brass nameplate to be put on top of pipes or marked at the upper ends.

The air pipes to be placed as close to the bulkheads and behind the stiffeners as possible.

The sounding pipe to be as straight as possible and equipped with brass cap. The lowest point of sounding pipe to be 50mm from tank bottom, where the collision plate with thickness of 10mm to be provided. Sounding pipe to be equipped with sounding head, near which the stainless steel name plate to be arranged, indicating the relative tank name.

PART 10 ELECTRICAL SYSTEM

10.1 General

10.1.1 General requirements

Equipment and materials to refer to the rules, regulations and conventions as described in "PART 1".

10.1.2 Equipment and materials

The environment temperature to be not above 50℃, electrical equipment to be able to work with full load in 50℃.

The protection degree of the electrical equipment to satisfy the requirement of ABS and the specification.

10.1.3 Others

Distribution boxes, control boxes to be provided with the principle wiring diagram for the maintenance and repairing.

The main switchboard to be provided with principle wiring diagram and operation instructions, for maintenance purpose.

Emergency light lamps and lanterns, emergency shutdown button, fire alarm button and alarm control units to be painted with the red marks.

Equipment and cables in the Unit to be reliably grounded and the cross-sectional area of grounding conductor to be according to the Regulations.

10.2 Power Supply

The power supply of the generator and consumer to be as follows:

Name	Voltage	Frequency	Phase	Wire	Remark
Main generator	AC 400V	50Hz	Three	Three	
Emergency generator	AC 400V	50Hz	Three	Three	
Electrical equipment	AC 380V	50Hz	Three	Three	
Galley and living equipment	AC 380V	50Hz	Three	Three	
	AC 220V	50Hz	One	Two	
Normal lighting	AC 220V	50Hz	One	Two	
Emergency lighting	AC 220V	50Hz	One	Two	
Temporary lighting	DC 24V			Two	
Inter communication equipment	AC 220V	50Hz	One	Two	
	DC 24V			Two	

Name	Voltage	Frequency	Phase	Wire	Remark
Navigation equipment	AC 220V	50Hz	One	Two	
	DC 24V			Two	
Radio equipment	AC 220V	50Hz	One	Two	
	DC 24V			Two	

10.3 Generator

10.3.1 Main generator

Five (5) main generator sets to supply power for equipment of the Unit. Parameters of the main generator to be as follows:

- Capacity: 450kW
- Voltage: AC400V
- Current: 812A
- Phase: 3 phase
- Power factor: 0.8
- Frequency: 50Hz
- Insulation class: H
- Excitation form: Brushless
- Venting means: Air cooling
- Space heater: AC230V

10.3.2 Emergency generator

- Capacity: 250kW
- Voltage: AC400 V
- Current: 451A
- Phase: 3 phase
- Power factor: 0.8
- Frequency: 50Hz
- Insulation class: H
- Excitation form: Brushless
- Venting means: Air cooling
- Space heater: AC230V

The emergency generator to be provided with dual starting system, which shall satisfy the requirements of the Rules.

The emergency generator to be used for emergency operating condition. When the main power fails, it can be auto-started and then supply power within 45s.

10.4 Distribution System

10.4.1 General

The power system for this Unit to be AC400V, 3phase, 50Hz. It can supply power of AC 400V for equipment, such as two 400/230V transformers of 200kVA (which to be used to supply general power to the Unit) and jacking system.

The secondary winding of the transformers to be connected to the bus line of the 230V switchboard located in the switchboard room, which can supply the power for the normal lighting, control units, small motor, part of galley equipment and motor heaters.

All the buses and connection units in the switchboards to be made of cold drawn copper, tinned on the contact surface.

Insulated handrails shall be provided in front and back of the self-support switchboards (except the switchboards mounted against the wall); the switchboards (main generator panels & main AC400V consumer panels) shall be wired and maintained from the back. The oil resistant insulation mat to be arranged in front of the switchboards.

All the switchboards to be provided with insulation monitor, which will monitor the insulation of 400V and 230V busbar.

Selective protection analysis of the circuit breakers to be operated by the main switchboard manufacturer.

10.4.2 Main switchboard

The main switchboard to be of self-supported type, which containeleven (11) panels as follows:

- | | |
|--|----------|
| · Main generator control panel & synchrony panel | 6 panels |
| · AC400V consumer panel | 2 panels |
| · AC230V consumer panel | 1 panel |
| · Group starter panel | 2 panels |

Main generator control panel & synchrony panel includes five (5) generator control panels and one synchrony panel.

The main AC distribution panel to include the necessary devices to provide the necessary control and protection functions according to the requirements of Classification Society and the relevant authorities to control the generators and for power distribution.

Interlock between the 400V MSB, and the 400V ESB, shore connection box.

The specific control methods and functions to be according to the requirements of the Rules and Regulations.

10.4.3 Emergency switchboard

The emergency switchboard to be of self-support, wired and maintained from the front.

Three (3) panels to be provided, which are:

- Emergency generator control panel 1 panel
- 400V consumer panel 1 panel
- 230V consumer panel 1 panel

The emergency switchboard to control the emergency generator and feed power to emergency consumers. The emergency switchboard to be equipped with monitoring gauges and automatic switching device according to the requirement of the rules and standards.

10.4.4 Shore connection box

One (1) shore connection box to be equipped on the main deck. The shore connection box to be AC400V, 3 phases, 400A, with phase sequence indicator, kilowatt hour meter, etc. Shore power to be interlocked with the main generator.

10.4.5 Power and lighting distribution box

Distribution boxes shall be provided with doors and locks, except in the spaces where panels are constantly under supervision of personnel, such as in control rooms and machinery spaces

Main buses of the distribution boxes to be of 3 phases, 3 wire. Connections for single phase loads to be allocated at the main buses in such a manner as to maintain a balanced 3 phase system.

All distribution panels to be factory assembled, circuit breaker type, completely service from the front. Bus work to be copper with tin plated connections.

10.4.6 Electrician test panel

The Unit to be equipped with an electrician test panel for testing light bulbs, fluorescent tubes, fuses and other small electrical equipment. The input for the test panel to be AC400V and the output to be as follows:

- AC380V3ø 10A
- AC220V1ø 10A
- AC0~250V1ø 2A
- DC24V 10A

Supports of fluorescent lamps to be moveable.

10.5 Jacking System

The jacking system to be controlled by PLC. Important components to be provided with

sufficient redundancy. The jacking system to consist of:

- 1 central control console installed in jacking control room.
- 4 local control panels respectively installed on the side of the legs.

The PLC control system to be programmed to prevent operating at the same time from both central control console and control substation.

10.5.1 Central control console

Central control console includes:

- Four (4) control lever: LEG RISE/LEG LOWER
- One (1) control lever: HULL LOWER/ HULL RAISE
- One (1) switch with key: ON/OFF
- One (1) shift switch: CENTRAL/LOCAL CONTROL
- One (1) pushbutton: LAMP TEST
- One (1) audible alarm
- One (1) pushbutton: MUTE. The audible alarm stops while the fault alarm is activated.
- One (1) bubble type tilt sensors (one ranged 0-2° and the other ranged 0-5°)
- One (1) electronic tilt sensor
- One (1) emergency stop switch: Emergency stop.

One (1) sub-screen to be provided for showing the tilt of the Unit.

10.5.2 Jacking system substation

The local control panel on each leg side to include:

- Two (2) pushbutton: "LEG RISE"- "LEG LOWER"
- One (1) request button
- One (1) emergency switch
- One (1) lamp test
- One (1) local lamp
- One (1) remote lamp
- One (1) alarm buzzer

The system to be designed by the equipment supplier.

10.6 Transformer

Unless otherwise specified, all the transformers installed in the Unit to be of dry type, air-cooled marine transformer.

10.6.1 Main lighting transformer

Two (2) main lighting transformers to be provided in the engine room, with each other as

standby to supply power for lighting and day life consumers, the specification to be as follows:

Rated capacity:	200kVA
Voltage:	400V/230V
Frequency:	50Hz
Phase:	3-phase
Protection class:	IP22
Type:	dry-type
Insulation class:	F

10.6.2 Emergency lighting transformer

Two (2) emergency lighting transformers shall be provided in the emergency generator room to supply power for lighting and consumers, the specification to be as follows:

Rated capacity:	50kVA
Voltage:	400V/230V
Frequency:	50Hz
Phase:	3-phase
Protection class:	IP22

10.7 Cables

10.7.1 Selection of cables

.Except the cables of the communication system and special devices supplied by equipment supplier, Most of the cables used in the unit to be of bunched cable flame retardant, halogen-free, low-smoke, low toxicity marine type. Manufacture and installation of cables to meet the relevant IEC standards and rules of classification society.

Double banking of cables is to be avoided as possible. However, where double banking is necessary due to space limitation, it shall be according to ABS requirements. All cabling to be neatly positioned and strapped in trays.

Power cable to be 0.6/1 kV, instrument and control cable to be 250V.

Cross-sections of the conductor to be determined according to the current which is calculated under the condition of an ambient temperature of 50°C and the permissible operating temperature of the cables or wires of 90°C.

The cables to be listed in the below table, except those imported and supplied by equipment maker:

Type	Cable Type
CJ85/SC	XLPE insulated tinned copper wire braided cross-linked polyolefin outer sheathed bunched cables flame retardant, Halogen-free, Low-smoke shipboard power cable
CHJP85/SC	XLPE insulated wire or twisted pair with individual shield tinned copper wire braided cross-linked polyolefin outer sheathed bunched cables flame retardant, Halogen-free, Low-smoke shipboard symmetrical communication cable
CJ85/NC	XLPE insulated tinned copper wire braided cross-linked polyolefin outer sheathed fire resistant bunched cables flame retardant, Halogen-free, Low-smoke shipboard power cable
CHJP85/NC	XLPE insulated wire or twisted pair with individual shield tinned copper wire braided cross-linked polyolefin outer sheathed fire resistant bunched cables flame retardant, Halogen-free, Low-smoke shipboard symmetrical communication cable
75Ω or 50Ω	Cross-linked polyethylene insulated vertical hole coaxial cable cross-linked polyolefin jacket

10.7.2 Cable test after installation

All cable installations to be tested and documented for insulation test prior to any energizing of that circuit.

10.7.3 Cable penetration

MCT will be used for bunch of cable penetration through deck or bulkhead of A-60, for the penetration through the floor of the main switchboard room, and for the penetration of the emergency switchboard floor. Otherwise, when the cable penetrates through the bulkhead and deck that demand watertightness and fireproofing, shipyard-fabricated penetrations will be used, and the penetrations will be sealed with fireproof or watertight stuffing approved by ABS.

10.8 AC Motor

It is designed that all the motors shall be able to work in the environment as specified by the Rules and Regulations. Motors to be squirrel-cage induction, asynchronous marine motor.

The motor of submersible pump to be powered via a continuous submersible cables. The cable from motor to hose reel winch to be supplied by the pump supplier.

10.9 Motor Control Centers and Controller

The emergency shutdown unit to be provided to the breakers for which emergency shutdown is required.

For the controllers with control units, such as level, vacuum, pressure and etc., if these

control units fail, the main control unit shall be able to be operated continuously by the manual / automatic switch function.

The space heater of the motors shall be able to start automatically when the motor stop. And the control panel to be equipped with a switch to turn off the power of the space heater manually. All the controllers shall be able to be controlled with control circuit of 110V or 220V. The control transformer in the controller to supply power to the controller. Ammeter to be provided for starters of motors above 50kW.

10.10 Lighting System

10.10.1 General

The lighting system to be designed for operation under 220V, 50Hz, single-phase AC power.

Accommodation rooms, jacking control room, public space and the rooms with lining panel & ceiling to be equipped with non water proof lighting fixtures, switches and sockets.

E/R, pump rooms, toilets, bathrooms, dry stores, chiller, freezer and the rooms without lining panel & ceiling to be equipped with waterproof lighting fixtures, switches and sockets.

The cold stores to be fitted with roof type lights with switch outside the room.

10.10.2 Normal lighting system

- Machinery space, such as engine room and other machinery room, to be equipped with 2 × 20W fluorescent pendant light.
- Living cabins to be provided with 2 × 20W fluorescence ceiling lights.
- Mess room and lounge to be equipped with 2 × 20W fluorescent ceiling lights
- Corridors with ceiling to be equipped with fluorescent corner light of 1X20W
- Fluorescent pendant lighting of 2 × 20W or incandescent pendant lights to be used in outdoor area.
- Flood lights to be installed for deck lighting.

10.10.4 Emergency lighting system

Emergency lights to be at least installed at the following locations:

- Engine room
- Galley, mess room and medical room
- Pop station of life raft
- Embarkation of lifeboat
- Switchboard room
- Jacking Control room

- Wheelhouse
- Public spaces
- Escape routes

10.10.5 Temporary lighting system

The Unit to be equipped with the temporary lighting system, which shall be combined with the emergency lighting system. For the temporary lighting of incandescent lamp powered by general charging & discharging panel, when the emergency power supply fails, the battery powered general charging & discharging panel shall be capable of powering the lights for 0.5 hours.

The temporary lighting systems to be placed in the following areas:

- Living area passage
- Jacking Control room
- Wheelhouse
- Switchboard room
- Engine room
- Lounge
- Mess room
- Galley
- Emergency generator room
- Place where lifeboat is installed

10.10.6 Socket

Each accommodation room to be provided with sockets, which to be available for the following equipment:

- Desk lamp
- TV

Sockets of 220V to be provided in the passage of accommodation area for some portable devices, such as the vacuum cleaner.

All sockets in living quarter to be British standard except the dedicated sockets for some equipments made in China.

10.11 Battery and Charging-Discharging Unit

10.11.1 General

Unless otherwise specified, batteries used for the Unit to be of lead-acid maintenance free type. The batteries to be arranged in battery box, with warning plate of NO FIRE at side.

10.11.2 General use battery

One (1) set of general use battery to be provided, the capacity to be DC24V, 400Ah (12V, 200Ah x 4), which to supply power for equipment of DC 24V.

10.11.3 Radio battery

One (1) set of battery to be provided to supply power for radio system.

10.11.4 Engine room low voltage use battery

One (1) set of batteries to be provided to supply power for equipment and control system in engine room. The capacity to be DC 24V, 200Ah (12V, 200Ah x 2).

10.11.5 General charging and discharging panel

One (1) charging and discharging board with constant current and constant voltage to be provided in wheelhouse. The charger to satisfy the requirements for maintenance-free battery.

When the main power fails, the charging and discharging board to supply power for the temporary lighting system automatically. When the main power recovers, the power of temporary lighting system to be cut off automatically.

10.11.6 Radio charging and discharging board

One (1) set of charging and discharging unit for radio system to be provided by radio equipment supplier.

10.11.7 Low voltage system for engine room

One (1) set of battery and charging & discharging system to be provided in the switchboard room, which will provide DC24V power for control system and some other consumers other than emergency equipment.

10.12 DP System (DP-1)

The Unit to be provided with a set of dynamic positioning system, which to be fitted with an automatic control system and a manual position control system with automatic heading control. Transfer of control between the two systems to be initiated manually. An independent UPS to be provided for the control system and its associated monitoring and reference system. Each UPS to be capable of supplying power for a minimum of 30 minutes after failure of the main power supply.

Configuration of DP system:

DP control station

DP Control unit

UPS

Transfer of control

Alarm & Event Printer

Configuration of JOYSTICK system:

IJS Control station

IJS control unit

Reference system:

DGPS 2 set

MRU

Gyro compass 2 set

Anemometer 2 set

When the Unit moves close to the other platform, the DP system to work with the jacking up system to keep in better position. When the Unit lifts the legs, the DP system to work with the jacking system to ensure not knocking into the platform nearby when the Unit is floating. .

10.13 Inner Communication

10.13.1 General

The inner communication system to include PA system, auto telephone, general alarm and so on.

Fire-resistant cables to be used for the inner communication system when the cables pass through the area of high fire risk.

10.13.2 Public address system

The Unit to be equipped with a set of marine amplifier of 2x300W (dual-amplifier), installed in wheelhouse; the loudspeakers to be staggered with the two loops

PA system to be connected with auto telephone system, which makes remote broadcasting and man-searching possible.

Loudspeakers of the Unit to also work as general alarm, which can send the following alarms:

- General alarm
- Fire alarm
- Abandon ship alarm

Remote control station to be set at the following locations:

- Jacking Control room
- Wheelhouse
- CO2 room

- Switchboard room
- Lifeboat station (2)

Speakers' loops to be divided into the following four loops:

- Deck loop
- Post loop
- Cabin loop
- Shout loop

10.13.3 Automatic telephone

One (1) set of digital automatic telephone exchanger to be provided for the Unit, with a total capacity of 160 subscribers.

Automatic telephone exchanger to have the following functions:

- Phone connected PA system (password connected)
- Connecting to the satellite communication station, which to be supplied by the Buyer

Automatic telephones to be provided for where is necessary.

Machinery space with noise, such as E/R and emergency generator room, to be equipped with flashing bell unit or combined alarm light panel, helmet-style headphones and microphone.

10.13.4 Sound powered telephone system

The Unit to be equipped with command sound power telephone system of 12 circuits, the selective sound powered telephone to be located in the wheelhouse console.

Extensions to be located at:

- Engine room
- Switchboard room
- Emergency generator room
- Lifeboat side
- CO2 room
- Bow thruster room
- Rudder propeller room
- Jacking control room

10.13.5 Engineer call alarm system

One (1) set of engineer call alarm to be provided in the switchboard room. When there is a failure alarm, the engineer in switchboard room can call the other engineers. The engineer can also be called in case of emergency.

10.13.6 Hospital call alarm system

Every bed in the ward to be equipped with a call alarm pushbutton, the audible and visual alarms will be arranged in the medical room, outside the entrance of medical room and in mess room No.2.

10.13.7 Emergency telegraph

Two sets of emergency telegraphs to be respectively arranged beside the two main engines, the transmitters to be respectively installed in the wheelhouse control console, the receiving devices to be respectively installed beside two main engines, the audible and visual alarms to be output to the buzzer units with flash lights.

10.13.8 Computer local area network (LAN) system

A set of computer local area network (LAN) system to be provided for the Unit. The cabinet of the LAN system to be installed in the radio room. The network terminal sockets to be arranged in living cabins, control rooms, offices, meeting rooms, lounge and library.

The LAN system can connect with Internet via the satellite communication system. (The satellite communications system to be provided by the Buyer)

The LAN system to provide the network, only including the exchanger, the network terminal and the cable installed to connect the exchangers and the terminals. The equipment inside the cabins to be purchased by the Buyer later.

10.13.9 Satellite TV system

One (1) set of satellite TV system to be provided for the Unit. The TV user terminal to be provided for all the living rooms and the public spaces as indicated in the related drawings. The satellite TV antenna to be arranged on 04 LEVEL. The main unit and antenna of satellite TV system to be provided by the Buyer.

10.14 Radio Communication Equipment

The radio communication system to satisfy the requirement for A1+A2.

10.14.1 Combined radio station

One (1) set of MF/HF (150W, with DSC) to be installed in the radio room. The combined radio station to mainly include the following facilities:

·MF/HF radio telephone	1set
·Control unit	1set
·Handset	1set
·Transceiver unit	1set
·Power supply	1set

·INMARSAT C station (including EGC, SSAS and LRIT)	1set
·Operation terminal	1set
·Keyboard	1PC
·Printer	1set
·Distress alarm panel	1set
·Control unit	1set
·Radio station combined station	1set
·Combined rack	1set
·Power and charger (50A)	1PC
·HUB	1set
·GPS distributor	1set
·Emergency light	1PC
·AC distribution box	1PC
·DC distribution box	1PC
·Standard accessory	1set

10.14.2 VHF radio telephone

One (1) set of VHF radio telephone (with DSC) to be provided and installed in the wheelhouse console.

10.14.3 NAVTEX receiver system

One (1) set of NAVTEX receiver to be provided. The power unit and the receiver to be fixed in wheelhouse console with pre-amplifier and whip antenna.

10.14.4 Satellite EPIRB

One (1) set of EPIRB to be provided on 04 LEVEL, working frequency of 406 MHz /121.5MHz. Built in high-capacity battery, and bracket fixed to be placed horizontally with no obstacles around.

10.14.5 Life boat and liferaft two-way VHF radio telephone

Six (6) sets of two-way VHF radio telephones of 500mW, VHFCH6 / CH16 channel to be provided, each with the built-in lithium battery. Four (4) pieces to be respectively placed inside the four lifeboats, and the other two (2) pieces to be placed in the wheelhouse.

10.14.6 Search and rescue transponder (SART)

Six (6) sets of 9GHz SARTS to be provided, with the working frequency of 9.2 ~ 9.5 GHz, each with the built-in lithium battery. Four (4) pieces to be respectively placed inside the four lifeboats, and the other two (2) pieces to be placed in the wheelhouse.

10.14.7 VHF AM telephone

One (1) portable type VHF AM telephone to be provided in the radio room for communication with the helicopter.

15.14.8 Non-directional beacon system (NDB)

One (1) set of NDB to be provided for this Unit. The cabinet of the NDB to be arranged in the jacking control room. The antenna tuning unit and antenna of NDB to be arranged under the helideck.

10.15 Navigation Equipment**10.15.1 Navigation radar**

One (1) set of X-band to be provided for the Unit.

The X-band radar configuration to as follows:

- Monitor 21"
- Antenna
- Gyro compass interface board
- Performance monitor

The input interfaces to be the Unit's position and speed signals from DGPS, the depth signal from echo sounder, AIS data signals, azimuth signal from gyro compass.

10.15.2 GPS receiver

The wheel house to be equipped with one (1) GPS receiver.

The component parts to include the antenna, satellite GPS, 16-way signal splitter and power supply unit.

The interface to be designed for VHF, AIS, radar, echo sounder and gyro compass.

10.15.3 Gyro compass

The Unit to be equipped with two (2) sets of gyro compass in the wheel house. The main unit to be located in the wheel house.

The azimuth signal to be output to DP system, radars, GPS, AIS (as required).

10.15.4 Magnetic compass

The Unit to be equipped with a standard magnetic compass on the compass deck (at the top of wheel house).

10.15.5 Echo sounder

The Unit to be provided with one (1) set of marine echo sounder.

The component parts of the echo sounder to include the power supply unit, monitors, recorders, transducer junction box and transducer.

The power supply unit, display/recording device to be located in the wheel house, and the transducer to be located in the echo sounder compartment.

10.15.6 Aerovane instrument

The Unit to be equipped with two (2) sets of aerovane for DP system. Wind speed and direction transmitter (sensor) to be located on the mast. The impact of the radar antenna rotating should be avoided. The receiver and power supply unit to be located in the jacking control room.

10.15.7 Window wiper

The windows of the jacking control room to be provided with pantograph wipers. The control panel to be installed on the jacking control room console, and powered by 220V power supply.

The windows of the wheelhouse to be provided with pantograph wipers. The control panel to be installed in the wheelhouse console, and powered by 220V power supply.

10.15.8 Ship security alarm system (SSAS)

The Unit to be provided with one (1) set of Ship Security Alarm System, the function of which to be provided by mini C station. The alarm buttons to be located in wheelhouse console and captain room.

10.15.9 Automatic identification system (AIS)

One (1) set of AIS to be installed for the Unit, composing of the main unit, power supply unit, VHF antenna, and GPS antenna.

The AIS can automatically provide the related information, such as the Unit's nationality, ship type, location, course, speed, navigational status and other relevant safety information to the coast receiver and other ship. AIS can also automatically receive information specified as above from the other ships, monitor and track these ships, and exchange data with the shore-based equipment.

10.16 Inner Monitoring and Alarm System

10.16.1 Fire detection alarm system

One (1) set of fire detection alarm system to be arranged in the wheelhouse. Smoke detectors to cover the whole Unit where is necessary, and the system to be displayed on the control panel.

The addressable program to be used for the fire detection system, with each point showing the alarm location.

The public space and space near the staircase to be provided with manual call points. The

waterproof type manual call points to be used where necessary.

The galley to be provided with the temperature detectors.

The fire detection alarm system to monitor the input signal of each detector continuously. When any kind of alarm is detected, the fire alarm control panel to be triggered to indicate the alarm position.

The fire alarm to be sent to general alarm system if there is no answer on the fire alarm control panel within two minutes.

The system to be powered by 220V power supply from both MSB and ESB, which can be switched automatically.

10.16.2 General alarm

One (1) set of general alarm system to be provided in the wheelhouse console. The system to consist of the general alarm unit, general alarm buttons and a variety of alarms and so on. General alarm to be activated from wheelhouse console and embarkation station of the lifeboat.

General alarm with light to be provided in stores, public toilets and where there is no speaker.

General alarm signal to be connected to PA system, which will work as part of general alarm.

General alarm to be activated if there is no answer to the fire alarm in two minutes.

The system to be powered by the main switchboard and charging and discharging panel which can be switched automatically.

15.16.3 CO₂ release alarm

The CO₂ release alarm control box to be arranged in the CO₂ room, which can send out the alarm in case of power failure and CO₂ leakage.

CO₂ release valve to have the function of 30 seconds pre-alarm in advance to send the evacuation alarm before release CO₂.

When CO₂ is released through the pneumatic control valve, the corresponding signal to be sent out automatically to shut off the cabin ventilation system and the oil pumps of related areas.

The engine room to be protected by CO₂ extinguishing system.

10.16.4 Refrigerator locked in alarm

One (1) water proof push button to be arranged in each cold store and one (1) ring with lamp arranged in galley and wheelhouse respectively, which to work as the lock-in alarm.

10.16.5 Indication of the watertight door

Indication lights of watertight door to be provided in the wheelhouse console to indicate the status of the watertight doors. Local indicator of the watertight doors also to be provided on both sides of the door.

10.16.6 Emergency shutdown (ESD) system

The emergency shutdown manual operation station to be equipped outside the machinery space, which can stop motor-driven fuel pump, the machinery space fans, air conditioners, as well as the main generators and emergency generator. The abandon ship alarm signal can be sent out via the general alarm system. The emergency shutdown operating stations to be equipped in the wheelhouse and at the exit of the living quarters to stop all the fans and central air conditioning system serving the space.

Abandon ship alarm buttons to be provided at side of the lifeboats and helideck.

10.16.7 Fire damper control system

Pneumatic driven electrical control type fire damper to be provided where necessary, and the status display of the fire damper to be provided in the wheelhouse console.

Electric driven fire damper to be provided in the wheelhouse to keep the wheelhouse safe from the fire, and the control unit to be provided in wheelhouse.

10.16.8 Combustible gas and H₂S detector

The combustible gas and H₂S detectors to be provided at the ventilation intake where necessary. The control box to be provided in the wheelhouse and the display unit to arranged in the wheelhouse console.

10.17 Navigation and Signal Light

10.17.1 Obstruction light and fog horn

One (1) set of obstruction light system to be provided to show the profile of the Unit. The system to include 4 lights of 1400cd, which to be installed besides the crawl culminating point of the spud legs.

One (1) set of fog horn to be provided on the top deck and the control unit to be located in the wheelhouse. The system to contain the charger and batteries, the capacity of the batteries to satisfy the fog horn and mark light operation for not less than 96 hours after the charger is disconnected.

10.17.2 Navigation & signal lights

Seven (7) signal lights of 2x65W to be provided. The navigation and signal light system to be powered by emergency switchboard through the navigation & signal light panel.

The following navigation lights to be provided:

- Port light——red
- Starboard light——green
- Stern light——white
- Mast light——white

10.17.3 Daylight signal light

One (1) portable daytime communication signal light to be provided in the wheelhouse.

10.17.4 Airplane caution light

Four (4) sets of self-control airplane caution lights to be installed on top of the legs, with battery, solar charger and photoelectrical switch.

The airplane caution lights on the crane boom to be provided and installed by the crane manufacturer.

10.17.5 Helideck lighting system

The Unit to be equipped with one (1) set of helideck perimeter light, flood light, status light and windsock light system. The control panel of the helideck lighting system to be installed in the jacking control room.

10.18 Jacking Control Room

Jacking Control room to be arranged on the 4th level of the Unit.

The following system to be controlled/ displayed in the jacking control room:

- Jacking system
- Level monitoring repeater
- Auto telephone
- Sound powered telephone
- Public address system remote control unit
- Wiper control panel
- Helideck lighting control panel
- DP system
- Combined control console

10.19 E/R Monitoring System

The Unit to be equipped with one (1) set of E/R monitoring system in the switchboard room, which can monitor the working status and alarms of the major equipment. This system to be installed on the centralized monitoring console in the engine room.

10.20 Wheelhouse Control Console

Wheelhouse control console to be provided in wheelhouse on the 3rd level of the Unit.

The following system to be controlled/ displayed on the control console:

- Echo sounder control & display
- Auto telephone
- Sound powered telephone
- Public address system remote control unit
- General alarm unit
- VHF phone
- GPS
- AIS
- Navigation & signal light control panel
- State display of watertight doors
- Control box for fire damper
- SSAS alarm button
- AC230V distribution box
- DC24V distribution box
- Wiper control panel
- Outdoor lighting distribution box

The console to include two navigation power distribution boards (one to be powered by the emergency switchboard and the other one to be powered by general charging and discharging panel), which to supply power for the equipment in the wheelhouse console.

10.21 Engine Room Centralized Monitoring Console

One (1) set of engine room centralized monitoring console to be arranged in the switchboard room.

The equipment installed on the engine room centralized monitoring console to mainly include:

- Automatic telephone
- Sound powered telephone
- PA remote control substation
- Engineer call main unit
- Remote displays of main engines
- E/R Monitoring System

PART 11 INSPECTION, SURVEY, TEST AND SEA TRIAL

11.1 General

The construction, installation of the equipment and delivery to be done under supervision and conform to the requirements of the Owner, Classification Society and Regulatory Bodies.

11.2 Inspection and Test during Construction

All the inspections, surveys and tests of the hull structure installation and welding to be in compliance with the relevant drawings, China Shipbuilding Quality Standard, the Classification Society rules or the shipyard standard approved by the Owner, and approved by the Owner's representatives and Class surveyors.

11.2.1 Hull structures

The inspection and tightness test to done for the liquid tanks, cofferdams, superstructure decks and other water collection areas. The method of the test to be according to the tightness test program approved by the Owner and Classification Society.

The welding quality of hull primary members to be examined by radioscopy, ultrasonic examination or other defectoscopy. The examination to be carried out according to the requirements of the Classification Society rules. The extent of NDT to be approved by the Owner and Classification Society.

11.2.2 Block inspection

The acceptance inspection of the blocks to be carried out after the structure welding and pre-outfitting is finished. The fully or partially installed outfit items to be not removed, unless such outfit items affect such inspection.

11.2.3 Shop trials

Shop trials for the main engines, auxiliary equipment, deck machinery, motors and the necessary equipment to be performed in accordance with the Classification Society's requirements and/or the standard of the suppliers.

11.2.4 Installation and equipment

Installation of equipment to be tested in accordance with the requirements of the Classification Society and/or Regulatory Bodies and the standard procedure of the Builder.

The structure, fittings, machinery and electrical equipment to be tested after installation on board to demonstrate the satisfactory workmanship, proper working, suitability for the

purpose intended and compliance with rules and regulations.

11.2.5 Piping test

Working test of the piping system to be carried out after completion of such system. Pressure tests of piping systems to be conducted as per requirement of the Classification Society and normal shipbuilding's practice.

11.3 Inclining Test

When the Unit is substantially completed except the minor work items, the inclining test of the Unit to be carried out by the Builder near the wharf. The inclining test procedure to be submitted to Classification Society and the Owner for approval. The inclining test to be conducted in the daytime with the appropriate weather condition.

The light weight measurement to be carried out by reading the draught of the Unit, measuring the specific gravity of water, investigation and collection of weights to be added or deducted.

The draught of the Unit to be read at both sides of stem, stern and midship draught marks. Displacement of the Unit to be measured from the 'Hydrostatic curve table'. All the measurements and correction to be made as per international standard.

If any extra weight is on board the Unit or any item belonging to the light ship weight, but is not on board the Unit at the time of the light ship weight measurement, such weight to be adjusted accordingly.

The calculation of the light weight and deadweight to be made by the Builder and verified by the Class Surveyor in order to determine "light weight" and "deadweight".

The inclining test to be carried out with the attendance of the designer and Class surveyor. The position of the centre of gravity in lightship condition to be calculated based on the results of the inclining experiment.

11.4 Trials and Tests at Sea

The sea trial to be carried out by the Builder when the Unit is substantially completed, i.e. mooring trial finished, defects remedied, all equipment and outfitting are ready, painting work almost completed.

The procedure of all trials (including sea trial and dock trials) to be submitted to the Owner for approval 30 days in advance.

Prior to sea trial, dock trials to be carried out for all the required machinery and system.

Detailed sea trial procedure to be submitted to Buyer for approval in advance.

Reports of sea trial to be submitted to the Owner for approval.

11.5 Jacking Test

The Builder to compile the jacking test procedure according to both the manufacturer and

Designer's test procedure and submit it to the Classification Society and Designer for approval.

11.6 Other Tests

The following tests and adjustments to be carried out at the proper time:

- 1) All tests required by the Classification Society
- 2) Tests of refrigeration equipment and refrigeration chamber
- 3) Test of mechanical ventilation
- 4) Test of air conditioning system
- 5) Test of lifeboat and davit
- 6) Test of fire fighting system
- 7) Test of electric equipment including electronic navigational equipment
- 8) Function test of emergency lights
- 9) Ballast and bilge piping system
- 10) Working test of emergency fire pump
- 11) Charging test of main air reservoirs
- 12) Echo sounder test
- 13) Radio equipment test
- 14) General alarm and fire alarm test
- 15) Operation test of the hatch covers
- 16) Ballast water pumping out test. The time and the unpumped water to be measured.
- 17) Mooring winches and mooring arrangement

Detailed list of test items and procedures to be submitted to the Owner for approval.