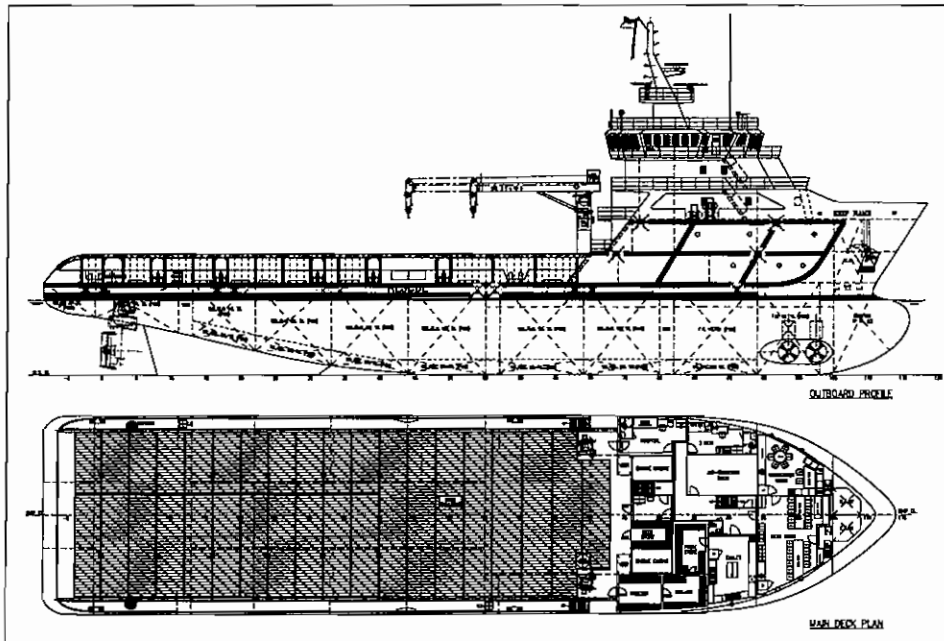


# TECHNICAL SPECIFICATION

FOR

## 75M Platform Supply Vessel

Hull No: DN75M-15



### CONSULTANT

#### **KHIAM CHUAN MARINE PTE LTD**

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### OWNER

#### **THAUMAS MARINE LTD.**

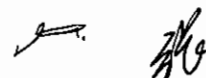
Palm Grove House,

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Tortola, British Virgin Islands

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## SECTION 1 - GENERAL

### 1. Intent & Definition

It is intended in this specification and accompanying plan to set forth the work to be executed and materials required for the completion and delivery of a vessel suitable for unrestricted service notation. The vessel will be completed in accordance with this construction specification, the contract specification, the contract plan and other drawings. The General Arrangement plan and this specification are intended to explain and supplement each other.

If any variance is found between the specification and plan, Specification shall govern unless otherwise "specifically" agreed. The construction and outfitting of the vessel to be carried out in accordance with good marine practice using good quality materials, equipment and machinery for the purpose intended.

The builder is to warrant the vessel in accordance with conditions of contract. Builder shall submit to the owner detailed listing of the manufacturer (address, e-mail, telephone no and mobile) and their worldwide agencies contact. Builder shall provide information on terms, coverage and the validity as well as expiry dates for all the equipment fitted on board.

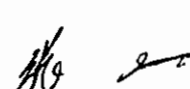
### Shipbuilder's / Contractors Responsibility.

- 1) Shipbuilder to be responsible for the liaison between sub-contractors of equipment requiring inter-linking to ensure proper interfacing and compatibility of equipment.
- 2) Shipbuilder alone to be responsible for the construction and quality of work for the ship. The fact that drawings and data have been shown to the Owners or approved by the Owners or their representative does not relieve the Shipbuilder in any way from the above mentioned responsibility.
- 3) During the building and outfitting of the vessel, Shipbuilder to exercise due care and diligence in the protection and the cleanliness at all times of equipment and pipe work being installed in the vessel. Particular care to be taken to protect equipment from dampness, dust ingress, weld spatter, paint and general mechanical damage to owner's approval. Any damage to be made good to owners satisfaction and at shipbuilders expense.

It is to be understood that anything not mentioned in this specification but required by the rules of the classification society for the intended service is to be supplied by the builders. Metric system to be adopted for design and construction of hull, machinery, equipment, finished plans, tank calibrations, trim and stability calculations, etc. All gauges thermometers, etc. will be supplied in metric unit.

The following terms will be used in this specification:-

- |                   |   |                             |
|-------------------|---|-----------------------------|
| 1) Owners         | : | THAUMAS MARINE LTD.         |
| 2) Builders       | : | FUJIAN SOUTHEAST SHIPYARD   |
| 3) Classification | : | AMERICAN BUREAU OF SHIPPING |
| 4) Consultant     | : | KHIAM CHUAN MARINE PTE LTD  |



## 2.General Description

The vessel shall be designed and built as twin (fixed pitch rudder propellers), two bow thrusters, and two station controls in wheelhouse. The vessel is suitable to be used as offshore supply and fire fighting Class 1 vessel.

The vessel accommodation is located forward above the main deck. The main hull is to be divided by five (5) watertight bulkheads into six(6) compartments:

- 1) Fore peak Drill Water Tank / Water Ballast Tank.
- 2) Bow Thruster Compartment, F.W. Wings Tanks (P&S)
- 3) Engine Room / Foam Tanks / F.O. Tanks / F.O. Day Tank / L.O. Tank etc.
- 4) Bulk Cement Tank Compartment, Water Ballast/ Drill Water, Mud Tank, F.O. Tanks (P&S) and Brine/Water Ballast Tanks.
- 5) Drill Water / Water Ballast Tank and Thrusters Machinery Room.
- 6) Aft peak void tank & Drill Water / Water Ballast Tanks (P & S).

The Supply vessel is for operation in unrestricted waters and is designed for multi purpose roles which for guidance are as follows:

- a) Transport fresh water, diesel oil, bulk cement, liquid mud, base oil and Brine, stores, materials & equipment.
- b) External fire fighting
- c) Move men and materials between platforms
- d) Rescue men fallen overboard
- e) Operation to be 24 hours/day continuous operations, capable of remaining on station for a about of 28 days.

Excellent manoeuvrability and station keeping, is achieved by using twin rudder propellers and 2 each transverse bow thrusters. Twin manoeuvring consoles are fitted in the wheelhouse stations, forward and aft.

The wheelhouse is designed to ensure excellent all round view. Unobstructed towards the aft deck.

The accommodation is centrally air-conditioned.

All documentation shall be in the English Language.

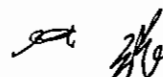
### Speed

Speed are to be assessed during performance trials. The vessel is to demonstrate a minimum of 13.0 knots speed with vessel loaded to ballast condition with vessel loaded to 5.5M draft. The main engines are to develop their 100% MCR continuous rated brake horsepower for the free running speed.

Free running speed trials shall be measured over an approved "measured mile" course or by GPS at a maximum engine 100% MCR power, in deep water.

### Service Conditions

The vessel's plant, machinery and equipment, their components and related systems shall be entirely suitable for service under the following conditions: -



Ambient air temperature (summer)	50 deg C (max) 10 deg C (min)
Relative humidity	100% (max) 0% (min)
Sea water temperature	36 deg C (max) 15 deg C (min)

Operational working conditions

Wind velocity	:	18 M/sec (35 knots) approx.
Significant Wave Height	:	2.5 M (8.2ft) approx.
Current Velocity	:	1.0 M/sec (2 knots) approx.
Wave Period	:	10 sec approx.

3.Principal Particulars

Length over all	:	75.00m
Length water line	:	72.88m
Length b.p.	:	67.85m
Breadth moulded	:	17.25m
Depth moulded	:	8.00m
Draft designed	:	6.50m approx.
Accommodation	:	Crew 14 x 1-berth cabins =14 18 x 2-berth cabins =36

Total = 50

Tankage (approx.)

Fresh Water	:	abt. 500m <sup>3</sup>
Drill Water / S.W. Ballast	:	abt. 1500m <sup>3</sup>
Fuel Oil	:	abt. 750m <sup>3</sup>
Dirty Oil	:	abt. 10.0 m <sup>3</sup>
Lub Oil	:	abt. 10.0 m <sup>3</sup>
Bilge Holding	:	abt. 10.0 m <sup>3</sup>
Base Oil	:	abt. 150 m <sup>3</sup>
Bulk Cement	:	abt. 226m <sup>3</sup> (four (4) cement tanks each of 2000 ft/3)
Mud/Rec Oil	:	abt. 730 m <sup>3</sup>
Foam	:	abt. 14 m <sup>3</sup>
Detergent	:	abt. 14 m <sup>3</sup>
Speed	:	Min of 13.0 knots in ballast condition.
Endurance	:	28 days approx.
Range	:	Abt 8,500 nautical miles at 12 knots
Deadweight	:	3,000 tonnes approx at Max Draft
Deck cargo	:	1,200 tonnes
Deck area	:	Minimum of 700 m <sup>2</sup> .
Deck strength	:	5.5 t/m <sup>2</sup> uniform loading
Gross tonnage	:	2950 approx.
Net tonnage	:	885 tonnes approx.

*Handwritten marks: a signature and a checkmark.*

#### 4. Classification

The vessel is to be registered as a platform supply and fire fighting vessel and is to be constructed, machinery installed, equipment and spare gear provided in accordance with the latest rules and regulations of American Bureau of Shipping (at time of keel laying) for Unrestricted Service and to their special survey to hull and machinery for class notation ABS +A1 (E) Offshore Support , Fire Fighting Vessel Class-1 OSR-C2+AMS, ACCU + DP2

#### 5. Certificates & Registration

The following certificates are to be supplied to the owners (one original, two photocopy) at the time of delivery of the vessel. One copy each is to be placed on board the vessel:

- |  |  |
|--|--|
| 1) Builder Certificate   | Shipyard   |
| 2) Interim Classification Certificates (hull and machinery)        | ABS  |
| 3) Cargo Ship Safety Equipment Certificate                         | ABS  |
| 4) International (1969) Tonnage Certificate (Interim)              | ABS  |
| 5) Provisional Load Line Certificate                               | ABS  |
| 6) Cargo Ship Safety Construction Certificate (Interim)            | ABS  |
| 7) Interim IOPP Certificate  | ABS  |
| 8) Marpol 73/78 Annex IV & V (Statement-Of-Fact) I, VI (IAPP Cert) | ABS  |
| 9) Deratization Certificate  | Shipyard   |
| 10) Launching Certificate  | Shipyard   |
| 11) Asbestos Free Certificate                                      | Shipyard   |
| 12) Spark-Free Certificate   | Engine makers  |
| 13) Cargo Ship Safety Radio Certificate (Interim)                  | ABS  |
| 14) SOPEP Manual   | Owner Supply ABS (Approved)                              |
| 15) Cargo Securing Manual  | Owner Supply ABS (Approved)<br>KCM to prepare and submit |
| 16) ILO 133 Accommodation Certificate                              | KCM to submit to MPA                                     |
| 17) NLS Certificate (owner apply)                                  |  |

#### 6. Regulations

The following regulations are to be complied with

- 1) Rules and regulations of the Classification Society.
- 2) International Load line Convention, 1996 (Type "B" Freeboard)
- 3) International Convention for the Safety of Life at Sea, 1974 including amendment of 1981, 1983, 1991 (herein called "SOLAS")
- 4) International Regulations for Preventing Collisions at Sea 1972 including amendment of 1981.
- 5) IMO Resolution MSC 235(82) for stability.
- 6) MARPOL 1973/78 Annex I, IV, V & VI
- 7) International Telecommunication Regulations
- 8) International Tonnage Regulation 1969
- 9) The vessel shall be registered under Singapore Flag, and all flag requirements to be complied with.
- 10) IMO Res. MSC 226(84) Code of Safety for Special Purpose Ships (2008) for less than 60 special personnel

#### 7. Materials & Workmanship

All materials and workmanship are to be of good quality. All steel plates, sections, hull forging and casting are to meet the classification requirements.

All smith work of fabricated fittings to be of neat design, strong, smooth and free from defects.

All castings are to be manufactured to Classification requirements and approval.

Steel castings are to be manufactured to Classification requirements and approval.

All anchor cables fastenings, davits, shackles rigging, heavy gear handling equipment, winch cables, mooring ropes to be made of materials, which have been approved by Classification or Statutory Body or Manufacturers. All electric fittings on exposed decks to be weather proof.

All woods used, to be suitable for the intended purpose and of the good quality.

All materials for bolts, nuts, outfitting, etc that are exposed to weather should be of galvanized steel, suitable for the intended purpose.

#### 8. Welding

The vessel is to be of all welded construction.

Welding of frames, beams and stiffeners throughout except tanks such as Fresh water, Fuel oil, Lube oil, Drill water, Liquid mud to be intermittent, otherwise welding in accordance with Classification requirements.

Temporary lugs are to be burnt off the rags flushed, ground and smoothen.

All external stiffeners exposed to the weather or in wetted areas to be continuously welded, unless otherwise stated.

#### 9. Testing

All tanks and bunkers complete with all fittings and piping are to be tested under water or air pressure to Classification requirements prior to painting in way of welds.

All decks, flats, shell, bulkheads, etc to be water flooded or hose tested, as required by Classification.

#### 10. Trim & Stability

The ship is to have sufficient positive stability in all normal conditions of loading to comply with the standards as recommended by the Authorities.

The results of the inclining experiment are to be used in the preparation of comprehensive Trim and Stability Book for the use of ship's officers.

The stability data is to include loading conditions sufficient to cover all normal operating roles.

The completed Trim and Stability Book is to be submitted to the Regulatory Authorities for approval.

#### 11. Dock Trials

Dock trials are to be carried out in accordance with a program agreed with the Owner, to check operation of all machinery. Propulsion machinery, engine room auxiliary machinery, and deck machinery is to be tested.

All pipeline systems and ventilating systems are to be tested.

## 12. Inclining Experiment

Before sea trials, and with the vessel in as complete condition as possible, an inclining experiment is to be carried out to determine center of gravity.

For more than one vessel of the same class, the inclining experiment is to be carried out for the first vessel only. And light ship survey is to be carried out on subsequent vessel, provided the conditions of the vessel and the other factors remain within the prescribed limit, and subject to classification requirement and approval.

A report on the inclining experiment is to be supplied to the Owner.

## 13. Sea Trials

Sea trials are to be carried out in accordance with a program agreed with the Owner and Classification Society.



Cost of Fuel oil, lubricating oil, fresh water, pilotage, tugs and dues for the trials are to be borne for by the Builder.

The diesel fuel oil and lubricating, remaining on board at delivery will be taken over by Owner and paid for at current rates.

The compasses are to be adjusted during the trials.

1. Speed trials are to be conducted over a recognized measured mile or by GPS with the engines running at maximum revolutions. Three (3) double runs are to be made at 100% MCR and the mean speed to be calculated from the means with and against the tide.
2. In addition, one (1) double run each is to be made at 75% and 90% MCR respectively and means of each calculated.
3. With the vessel under full headway and the engines running at their full revolutions, the Z-propeller is to be reversed to full astern. After the vessel has reached full astern and with engines running at their full revolutions, the Z-propellers are to be reversed to full ahead, and the vessel is to run until the output of the engine has reached full headway. During this trial, the rudder propellers are to be kept amidship.  
The course, time and distances for these maneuvers are to be recorded.
4. Crash stop from full ahead to astern to be carried out and the distance measured. A full power continuous endurance trial in conjunction with speed trial is to be carried out for a period of not less than four hours. Throughout the period readings of pressures and temperatures are to be recorded as per engine manufacturers' recommendation.
5. Steering gear trials are to be carried out, in accordance with Classification Society requirements.
6. Anchor trials are to be carried out in accordance with Classification requirements.
7. The bow thrusters unit are to be tested.

The engine power output and fuel oil consumption is to be taken at MCR and recorded.





#### 14. Sound Level Readings

For record keeping purposes, sound level readings in dB (A) shall be taken in various compartments and on the fore and aft decks, including the engine room. Particular attention to be paid to accommodation spaces where adequate sound proofing absorbent material is to be fitted. Vessel to meet vibration requirements IMO Resolution A468(VII). Attention to be paid that speaker can be heard in WC of cabin.

The builder is to make reasonable effort to prevent occurrence of local vibration and rectify at their expenses any unsatisfactory vibration arising during tests and trials. Builder is to pay particular attention to avoid resonance by choice scantling alignment of bulkheads, acoustic barriers etc.

#### 15. Cleaning & Preservation

The builders shall ensure that all machinery, equipment, piping, bilges and tanks are cleaned and reasonably dry prior to delivery and acceptance by the owner. If delivery of vessel is affected more than six (6) months after launching, all underwater parts and propeller blades shall be cleaned.

Main engines, auxiliary machinery and propeller units shall be protected between shop trials and sea trials by a method of inhibiting corrosion as per manufacturers recommendation.

#### 16. Drawings

Three (3) print of the following class approved plans shall be provided for the vessel at the time of delivery of the vessel. In addition to below, any other plans or technical detail working plans which are required in construction of the vessel shall be approved by ABS and submitted to owner upon delivery.

- General Arrangement
- Engine Room Arrangement
- Construction Profile
- Midship Sections
- Shell Expansion
- Deckhouse Structure
- Schematic Piping Diagrams
- Capacity Plan / Sounding Tables
- Stability Booklet
- Dry Bulk Cargo Piping System and Layout (Supplier)
- Docking Plan
- Safety Plan
- Three sets of all instructions books and spare parts catalogues in English supplied by the various machinery and equipment suppliers shall also be provided at time of delivery of the vessel.
- As fitted drawings – 3 complete sets
- As fitted soft copy in compact Disc (CD) – 2 pcs

Additional requirement:

Yard should send piping and electrical schematics and one lines to owner for comments before these drawings being supplied to workshop, owner should reply in one week, otherwise yard think

owner have agreed. The other drawings needn't be sent to owner for approval.

17. Framed Up Plans

The following plans properly framed and glazed shall be fitted on board: -

- General Arrangement Plan
- Capacity Plan
- Safety Plan and Fire Fighting Plan
- Certificates if required by relevant Authorities

18. Delivery

Delivery of the vessel is to be taken afloat adjacent to the Builder's yard. All formalities for custom, Immigration and quarantine clearance etc shall be completed and vessel shall be ready for immediate departure upon delivery.

19. Spare Gear

Builder is to provide spare parts as per Manufacturer standard.

20. Owner's Supply

- (1) Saloon wares, galley and mess utensils, blankets, clothes, linen, crockery, silver wares, cutlery, books, charts, medicine, bandages and other consumable stores.
- (2) Inventories such as carpenter and boatswain's stores other than builder's standard.
- (3) L.O. F.O. F.W., ETC.  
The builder to pay the cost for quantities of lube oil and fuel consumed during the trials.
- (4) Oil-spill detergent.
- (5) Fire foam liquid



## SECTION 2 - STRUCTURE

### 1. General

The steel hull and deck erections are of all welded construction. Transverse framing system is used throughout.

### 2. Keel

A flat plate keel 14mm thick is to be fitted connected throughout the length to the center girder. It is to be tapered at the forward end to the stem and connected to the aft centreline skeg.

### 3. Stem

The stem below the waterline is to be formed by a curvature plate. It is to be well shaped at the end to the keel plate and the upper stem plating.

Above the waterline, the stem is to be formed by a raked and radiused plate. The stem plate is to be stiffened by webs and breast hooks for pusher duties.

### 4. Skeg

A double plate skeg is to be fitted on the centreline and set forward of the propellers as shown on the General Arrangement.

### 5. Bottom Construction

The bottom is to be double bottom except forepeak tank. In order to give a structural continuity in the bottom, four engine girders, P/S are to be extended as far as possible and are to be linked with longitudinal bottom girders. Keel plating to be a minimum of 14mm throughout. Bottom shell plating should be a minimum of 12mm throughout.

### 6. Shell Plating

The bottom (including bilge strake) and side plating are to be longitudinally plated, to have welded butts and seams and except in way of openings for sea water inlets, hawse pipes and forefoot, etc. where heavy plates are to be fitted. Shell plating should be a minimum of 10mm throughout.

### 7. Frames

Frames are to be spaced at 600mm throughout and to be toe welded to the shell plating. Strong transverse ring frames (or webs) are to be fitted at suitable locations.

### 8. Beams

Main deck beams and Forecastle deck beams to be fitted accordingly.

### 9. Deck Girder & Pillars

Deck girders of fabricated sections are to be fitted in engine room, steering gear, and cement compartments in association with built-up "H" pillars.

### 10. Engine Girders

Engine girders of vertical plate with horizontal bearer are to be fitted. Chock fast or other approved pourable epoxy resin chocking compounds to be used for main engine and thruster mountings. Exact scantling which suits engine are to be chosen.

### 11. Main Decks

The main deck is to be longitudinally framed abaft the collision bulkhead, and supported by deck girders and deep transverses.

The deck plating aft of the superstructure is to be 12mm thick and to take uniformly distributed load of 5.5 tonnes/m<sup>2</sup>.

Elsewhere the deck plating is to be according to Classification requirements. The deck plating is to be welded direct to the shell.

The cargo deck, inside the line of the cargo rails, to be covered with 75mm thick local hardwood laid fore and aft. As shown on the General Arrangement.

Forecastle deck to be transversely frame and supported by girders. To have increased scantlings in way of deck machinery with insert plates, if necessary.

### 12. Water Tight / Oil Tight Bulkheads

The W.T /O.T bulkheads as shown on the General Arrangement are to be plated horizontally with two different thickness. The vertical stiffeners are to be spaced approximately 600mm.

### 13. Bulwarks

Bulwarks at main deck level to be 1100mm high extending from corners of transom to aft of forecastle, set in less than 75mm from shell side. Plating to be 8mm thick with suitable Angle as top bar and half round section on outboard edge. Bulwark stays welded to deck with doublers.

Aft bulwark top to be carefully shaped to slope down to stern. Cargo-rails aft to be carefully faired down to main deck.

Stowage fittings are to be arranged for the rig discharge hoses as required.

Freeing ports to be arranged in main deck bulwarks with area to Classification requirements. All transitions in the bulwark top are to be made as smooth as possible. Freeing ports to be lined with 12mm round bars.

Upper forecastle bulwark rail bar to be 125mm B.P. or equivalent. Freeing ports to be cut in upper forecastle bulwarks, if required by Classification Society.

Doubling plates to be fitted under bulwarks stanchion feet and in way of mooring pipes, etc.

Mooring pipes to be fitted as shown on General Arrangement and to be of cast steel.

### 14. Deckhouse

The deckhouse's front is to be plated with stiffeners. The sides and top are to be plated with stiffeners. The aft end bulwarks is to be plated with vertical stiffeners.

### 15. Wheelhouse

The wheelhouse is to plate all round including the top with vertical stiffeners and beams. Sound reducing acoustics to be installed in way of funnel.

#### 16. Cargo Rails

Cargo rails made of 300mm N.B SCH80 pipes fitted longitudinally along the main deck for the stowage of pipes etc. Height of cargo rails to be 2m above the main deck in way of "RESCUE ZONE".carved and full weld with 6mm steel plates

#### 17. Bilge Keels

One (1) bilge keel made of 450 x 12mm plate with 30mm dia. R.B. or equivalent to be fitted on the bilge strake between the chines, P+S on doublers.

#### 18. Manholes

All manholes are to be elongated shape with stainless steel studs and nuts. In way of accommodation, they are to be recessed type with flush wooden covers to match deck level.

In engine room and main deck, they are to be "raised" type, if necessary.

For ease of tank cleaning, the liquid mud tank manholes should be round and sized to fit a standard 55 gallon drum.

Covers to bead-welded for identification.

#### 19. Draft Marks

Draft marks are to be in metric, forward and aft and amidships as per the relevant regulations.

#### 20. Double Bottom & Skin

Double bottom and skin in way of machinery compartments is to be fitted as shown on the General Arrangement Plan.

#### 21. Fenders

Raked fender tubes with doublers to be welded to the forecastle plating between the deck line fenders as shown on the General Arrangement Plan. The ends of all fender pipes to be tapered. The shell plating is to be locally increased to 14mm in way of the bow anchors.

Suitable numbers of aircraft tyres are to be installed on shipside. Lugs for installing the fenders with 25mm galvanised chain to be supplied and fitted.

320mm width x25 mm thick steel plate fender to be welded to hull according to GA. 5 tractor wheels with diameter 1500mm to be installed at forward port and starboard both fwd side, [Total 10] other areas to be aircraft wheels.

#### 22. Watertight Doors & Hatches

Hand operated watertight doors with clear opening of minimum 1400mm high by 700mm wide if applicable are to be fitted as shown on the General Arrangement Plan. They are to be capable of local control, from either side.

Watertight hatches are to be fitted on the main deck between bulwarks and cargo rail and one on fore deck, as shown on the General Arrangement Plan. All coamings are to be as per Loadline Regulations. Lids to be capable of being opened and closed from inside and outside. Hatch covers to be counter-balanced if applicable for ease of opening from inside. Watertight door and hatches to be fabricated to Yard's standard design. Grease nipple should be installed to all hinges. Same apply to the Rescue door hinges

#### 23. Funnels.

Twin funnel uptakes to be arranged as shown on the General Arrangement Plan to accommodate the exhausts. Funnels to serve as engine room hot air exhausts. Vertical rungs to

be installed inside of funnel for maintenance.

#### 24. Masts

The main mast is to be fitted with brackets for the navigation lights. Bolts and nuts for fastening all navigation lights shall be stainless steel.

Small portable tubular pole mast to be arranged at stern to carry the anchor stern lights, if required.

Masts to have rungs carried on top, arranged for access to light trays and necessary fittings. Safety cage to be fitted for all heights above 2.5m.

#### 25. Rails & Stanchions

To be fitted around wheelhouse top, bridge deck, forecastle deck and elsewhere, as indicated on General Arrangement Plan.

Storm rails of 32mm diameter pipe are to be fitted along passageway inside accommodation spaces.

Handgrips to be fitted in way of W.C.'s and showers and where required in way of manholes and vertical ladders.

Top rails to be 40mm galvanized pipe, middle and bottom rails to be 19mm diameter solid rod. Stanchions to be 65mm x 12mm flat bar, spaced approximately 1200mm and welded to deck.

#### 26. Chain Lockers & Hawse Pipes

Two(2) chain lockers are to be constructed forward of the collision bulkhead. The capacity of each locker is to be sufficient to stow specified length of chain cables. The cables to be self stowing. The lockers to be formed by steel bulkheads, with solid half round stiffeners. The floor of the locker is to be thicker perforated steel plate of not less than 20mm thickness. Cable ends are to be attached with quick release.

Foot holes are to be cut in the center division adjacent to the access opening which is to be fitted with a watertight cover. Chain pipes and hawse pipes to be of welded steel construction designed to give easy stowage of the anchors and cables. A permanent flushing arrangement to be provided in the hawse pipes for cleaning the anchor cables.

#### 27. Rescue Zones

Rescue zones shall be established on both sides of the vessel and will meet with the following requirements: -.

- Each rescue zone shall be illuminated both on deck.
- Bulwarks shall be either removable type or have the opening to allow open working area.
- Scrambling nets shall be supplied to the vessel that can be fitted in the area of the rescue zone
- Suitable securing points for scrambling nets, safety lines and rescue boat.
- A clear access will be provided to the survivor holding area.
- Each rescue zones shall be free of shipside discharges.

#### 28. Engine Control Room

To be located at the tween deck in the engine room and equipped with:-

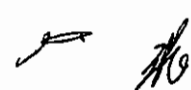
- a) Water-cooled independent air-conditioning

- b) Insulated bulkheads with shatter-proofed large glass window for good view of the engine room
- c) Writing desk and upholstered chair
- d) Sound-powered telephone

The main switchboard and engine room alarm panel are to be located inside this compartment.  
Access to the rear of the switchboards to be provided.  
Bright lighting including emergency lighting is to be provided.

29. Liquid Mud/Rec oil Tanks

Suitably constructed for cargo with specific gravity of 2.5 and fitted with pumps and piping.



### SECTION 3 - ACCOMMODATION, WHEELHOUSE & STORE

#### 1. General

The accommodation is to be arranged and fitted out in accordance with the General Arrangement drawing. Scheme of decoration together with colour for furnishing fabrics, plastic laminates, deck coverings paints etc, will be chosen by the builders who will try to follow owner's choice as closely as possible. Asbestos is not allowed to use for accommodation material.

All fixed and loose furniture including mattresses, as described in the following specification are to be supplied and fitted by the builders.

All internal doors are to be fire rated with baked enamel finished, hung on brass or SUS hinges and fitted with brass or SUS door fittings. Good quality deadlocks with three (3) labelled keys each are to be fitted to doors of cabins, stores and other compartments throughout accommodation. Brass or SUS locks are to be fitted to all drawers, cupboards, lockers, stores and cold / freezer rooms.

All stairways to be fitted with handrails on one side.

#### 2. Deck Coverings

Steel decks are to be thoroughly cleaned before the installation of deck coverings. Safety treads or steel chequer plates are to be fitted on all ladder footings and on the deck inside of accommodation.

##### Schedule of Deck Coverings

Wheel house top and wheel house

Deck exterior and main deck - non skid deck paint

Wheel house interior - 8mm latex deck composition finished with 2mm vinyl tiles

All cabins, messes and lobby - 8mm latex deck composition finished with 2mm vinyl tiles except carpet for Captains and Chief Engineer's cabins and all single man cabins.

Washrooms & galley - Ceramic tiles on cement with wire mesh reinforcement.

#### 3. Minor Bulkheads & Linings

All steel minor bulkheads are to be lined with panel of 25mm thk faced with PVC laminated galvanised sheet on one side. Store rooms to have steel minor bulkheads(AO) without insulation, internal of these compartments to be painted steel finish. Other free standing fire rated bulkheads are to be constructed with panel of 50mm thk faced with PVC laminated and galvanised sheet on other side.

Ceilings to be lined with Class BO metal strip in baked enamel painted finished suspended c/w hanger except in stores to be constructed with 6mm thick marine board faced with white plastic laminate on one side backer on the other side fitted onto galvanised channel.



Structural fire protection is to comply with SOLAS 1974, amendments 1981 & 1983.

#### 4. Insulation

All exposed steel work are to be insulated on the inside with suitable thickness of insulation material and retained behind the linings.

- 1) Wheelhouse - deck head and side
- 2) Deck house cabins - exposed deck head, bulkheads and sides.
- 3) Under main deck - Nil
- 4) Engine room in way of Accommodation area in accordance with SOLAS.

#### 5. Windows & Scuttles

All windows and port holes of steel frame type with appropriate thickness to suit the classification requirements and SOLAS.

Curtains to be provided.

#### 6. Wheelhouse

Wheelhouse to be equipped with all navigational instruments and electronics as specified elsewhere. Wheelhouse windows to be arranged to give maximum visibility all round, as far as practicable.

One(1) 310mm diameter heavy duty clear view screen to be fitted in window forward.

Four(4) off pendulum type windscreen wipers two(2) aft and two(2) forward) to be provided. Fresh water washing to be provided at windscreen wipers.

Hinged, GRP weather tight doors to be fitted each side of wheelhouse giving access to open bridge deck. Doors to be fitted with fixed windows.

The wheelhouse to have combined steering and engine maneuvering consoles fitted across the bridge, forward and aft.

In addition to navigational and electric equipment, the following items to be supplied and fitted in the wheelhouse:-

- Flag lockers for one complete set of International signal flags
- Binocular box forward
- Storm rails on consoles
- Chart table with drawers under and with save-all and slit on tabletop edge for the charts.
- Chart table lamp with dimmer
- One radio table (GMDSS Console)
- Radio operator's clock
- Three (two sliding type and one fixed type) The sliders are to be flushed with the PVC tiles.
- Helmsman chairs with arm rest, upholstered, adjustable in height and with foot rest
- Bookshelf and racks
- Upholstered settee, hat pegs, coffee table and coat hooks.

i) Radio Equipment

MF/HF

One (1) set MF/HF radio equipment c/w DSC is to be installed as follows:

- 1 System cabinet
- 1 Controller with display and keyboard/printer
- 1 Antenna tuner

VHF

Two (2) sets of VHF radiotelephone c/w DSC are to be installed as follows:

- 1 Main VHF radiotelephone c/w DSC
- 1 Aux. VHF radio telephone c/w DSC
- 1 Antenna

ii) Inmarsat

One (1) set of Inmarsat-C with EGC, including antenna, receiver and printer. In addition, the SSAS signal would be transmitted through above antenna.

And two SSAS alarm buttons should be provided.

iii) Echo Sounder

One (1) echo sounder with display & printer, and a repeater at aft station.

Power : AC 220V

iv) Radars

One (1) unit radar: 96N.miles 'X' band c/w daylight 20 inches display. A.R.P.A compliant.

One (1) unit radar: 96N.miles 'S' band c/w daylight 21 inch display.

v) Magnetic Compass & Gyro Compass

One (1) magnetic compass.

One (1) Gyro Master Compass, with the compass repeaters on forward and aft bridge console, 2 wing repeaters at W/H port side and starboard side, 1 Azimuth circle in wooden box, and a digital repeater in steering gear room..

vi) Speed Log

One (1) set of Doppler speed log is to be installed and to be fed from AC 220V.

vii) Anemometer

One (1) set of anemometer is to be installed to be fed from AC 220V.

viii) Window Wiper & Clear View Screen

Four (4) sets of electric window wiper are to be equipped on the front and aft windows in the wheelhouse and to be fed from AC 220V.

One (1) Clear view screen is installed forward starboard window.

ix) Delete

x) EPIRB

One (1) set of approved type satellite EPIRB is to be installed.

- xi) NAVTEX Receiver  
One (1) set of approved type NAVTEX receiver is installed to feed from AC 220V.
- xii) Two-way Portable VHF Radio Telephone (GMDSS Type)  
Three (3) sets of approved type 150mhz type two-way radiotelephone are to be installed as life-saving equipment.
- xiii) TV Receiver Set  
TV receiver of worldwide multi system and antenna set is to be installed in saloon. To be fed from AC 220V.
- xiv) GPS Navigator  
One (1) set of GPS navigator are to be installed in the wheelhouse and to be fed from AC 220V
- xv) Weather Facsimile  
One (1) unit of Weather Facsimile to be installed.
- xvi) Electrical Navigation Lights & Shapes  
A complete set of 220V AC supply dual lens navigation lights is to be supplied and fitted as specified in electrical section. In addition to this, the following is to be supplied.  
Two (2) black circular shape of 600 mm (24") diameter.  
One (1) black diamond shape.
- xvii) Flags  
One (1) complete set of International Code Flags and National Ensign.
- xviii) Horns  
One (1) air horn.
- xix) Ship's Bell  
One (1) 305mm (12") brass bell, engraved with the Ship's name and year of completion of the vessel and mounted at the starboard side bridge wing.
- xx) Joystick Control  
An integrated joystick control system is installed providing full interface as follows:  
b) Two rudder propellers  
c) 2 Bow thruster units  
Portable control positions in both forward and aft wheel house stations.  
Auto-pilot inter lock switch and control position change over switch are to be installed in fwd console stand.
- xxi) Engine Controls  
Electric engine control levers for the control of engines, rudder propeller and bow thrusters are to be fitted at two (2) control stations in wheel house.
- xxii) Rudder Indicators  
Two (2) sets : 1 forward console , 1 aft console . 1 thruster compartment for each

xxiii) Internal Communication

A) Automatic Telephone Exchange is to be fitted at the following.

- 1) Wheel house (installed in forward and aft console stand)
- 2) Captain's cabin
- 3) Chief Engineer's cabin
- 4) Mess rooms
- 5) Engine control room
- 6) Bow thruster room
- 7) Cement compartment
- 8) Officer's cabin (one-man cabin)
- 9) Crew's cabin
- 10) Passengers' cabin
- 11) Thruster/stern machinery compartment

Headset to be placed inside the SUS box mounted on the bulkhead should be in box for Bow Thruster and stern thruster machinery compartment

B) Sound powered telephone are to be installed in engine control room, steering Gear machinery compartment, wheel house, Captain and Chief engineer cabins, ME local stations, Emergency Generator Room.

C) Computer net wiring should provided in below room:

- 1) Wheel house
- 2) Captain's cabin
- 3) Chief Engineer's cabin
- 4) Engine control room
- 5) Officer's cabin (one-man cabin)

xxiv) Public Addressor

Amplifier is prepared at Wheelhouse

Talk back rain proof microphone is prepared as follows

Upper Forecastle deck forward

Aft bulkhead of superstructure

Speaker is equipped suitably.

Other talk back substation should be arranged in captain room, officer mess room, and galley.

Speakers are to be selected into the following groups at wheelhouse

Compass (exposed) deck

Machinery and Cargo space (under main deck)

Accommodation Passageway and Mess Room

xxv) Auto Pilot

One (1) auto pilot set mounted at forward of helmsman position.

xxvi) Clocks

One (1) battery clocks, Quartz type.

xxvii) Searchlights

3 x 2,000W halogen tungsten light with remote electric controls.

xxiii) Flood Lights

5 x 1,000W sodium vapour type (white light). Sufficient lighting required to illuminate working area.

xxix) Aneroid Barometer

One (1) Aneroid barometer.

- xxx) Chronometer  
One (1) set.
- xxxii) Flag Locker  
Flag locker fitted with complete set of signalling flags.
- xxxiii) Chart Table  
Chart table fitted with drawers under & chart light c/w dimmer control.
- xxxiv) Inclinometer  
One (1) bulkhead mounted heel indicator.
- xxxv) Aldis Lamp  
1 set to be provided.
- xxxvi) Chart (Owner supply)  
Navigational chart and necessary directories.
- xxxvii) Hand Leads  
2 sets with socket plug and 10 meter length cable c/w hand-held lamp

7. Captain & Chief Engineer's Cabins Loose furniture, chairs to be secured by turnbuckle.

These two (2) cabins situated on the officer deck as shown on the G.A. are to be fitted out identically as follows:-

- 1 built-in berth of 2,000mm x 1000mm x 150mm spring mattress with drawers and bunk light
- 1 desk with drawers and light.
- 1 built-in upholstered sofa.
- 1 built-in wardrobe c/w shelf, hanger rod and hooks with life jackets stowage on top.
- 1 upholstered chair.
- 2 coat hooks on back of door.
- 1 key box
- 1 quartz battery clock.
- 1 intercom telephone.
- 1 x 4 drawer filing cabinet with locks.
- 2x rectangle with portable aluminium storm cover to be provided
- 2 spare power point 220/1/50.
- 1 attached washroom (Module type)
- 1 x Television
- 1 x DVD Player

8. Attached Washroom for Captain, Chief Engineer's & Officer's Cabins, Meeting Room, Office, Hospital & Wheelhouse

These compartments to be fitted out identically as follows:

- 1 shower with curtain, soap dish and grab rail, hot/cold water tap.(except for W/H & outside mess room.)
- 1 washbasin with hot and cold water supplies.
- 1 W.C pedestal with seat and lid and toilet roll holder.
- 1 extractor grille.
- 2 coat hooks.
- 1 mirror, tray and lighting.

9. One-Man Cabins (12 nos) Loose furniture, chairs to be secured by turnbuckle

These one-man cabins situated on the Upper forecastle deck and officer deck as shown on the General Arrangement Drawing are to be fitted identically as follows:

- 1 built-in berth of 2,000mm x 900mm x 150mm spring mattress with drawers and bunk light.
- 1 desk with drawers and light.
- 1 built-in upholstered sofa.
- 1 built-in wardrobe c/w shelf, hanger rod and hooks with life jackets stowage on top.
- 1 upholstered chair.
- 2 coat hooks on back of door.
- 1 quartz battery clock.
- 1 x 300mm dia. scuttles with dead light covers.
- 2 power point 220/1/50.
- 1 attached washroom
- 1 key box (chief officer)

10. Office Loose furniture, chairs to be secured by turnbuckle

One (1) office situated on the upper forecastle deck as shown on the General Arrangement Drawing is to be fitted as follows:

- 1 desk with drawer and light
- 2 upholstered armchair
- 1 built-in upholstered sofa
- 2 steel 4-drawer filing cabinet
- 1 coffee table
- 1 sideboard
- 2 coat hooks on back of door
- 2 power point 220/1/50 complete with UPS for Deck top computer

11. Hospital Loose furniture, chairs to be secured by turnbuckle

One (1) Hospital situated on main deck are to be fitted as follows and provided with attached toilets: -

- 1 steel berths on rollers type of 2,000mm x 800mm x 150mm spring mattress with drawers and bunk light. Securing of hospital bed to be provided.
- 1 desk with drawers and light.
- 1 built-in wardrobes c/w shelves, hanger rods and hooks with life jackets stowage on top.
- 2 upholstered chair
- 1 medical locker
- 2 coat hooks on back of door.
- 1 quartz battery clock.
- 1 x 300mm dia. scuttles with dead light covers.
- 2 power point 220/1/50.
- 1 attached washroom

12. Two-Man Cabins (18 nos.) Loose furniture, chairs to be secured by turnbuckle

These two-men cabins, situated on the upper forecastle deck and forecastle deck respectively, are to be fitted identically as follows and provided with attached toilet:-

- 1 x 2-tier berth of 2,000mm x 800mm x 150mm spring mattress c/w bunk light, curtains, drawers under and ladder for the upper bunk.
- 1 desk with drawers and light.

- 1 built-in upholstered sofa.
- 2 built-in wardrobes c/w shelf, hanger rod and hooks with life jackets stowage on top.
  
- 1 upholstered chair.
- 2 coats hooks on back of door.
- 2 power point 220/1/50.
- 1 attached washroom

### 13. Mess Room Loose furniture, chairs to be secured by turnbuckle

One (1) mess room situated on the main deck as shown on the General Arrangement drawing are to be fitted out generally as follows:

- Built-in upholstered settee(s) with stowage under.
- Dining table(s) with Formica top and edge fiddles.
- Upholstered chairs or settees.
- Wall and Ceiling light with on/off switch.
- One (1) clock, battery quartz type.
- Four (4) 220/1/50 power sockets.
- One (1) sideboard with drawers.
- One (1) cold water foundation.
- One (1) 10 litre hot water urn.
- One (1) coffer maker
- One (1) 206 litre refrigerator
- One (1) 21" colour TV
- One DVD Player
- One Bain Marie for serving hot food.

### 14. Galley

The galley situated adjacent to the mess rooms is to be fitted out as follows:

- Two (2) marine electric ranges c/w 4 elements each, oven and exhaust canopy over.
- One (1) twin bowl deep sink fitted with macerator, shelves, lockers under and plate racks over.
- Assorted cupboards, workbenches, plate's rack, etc.
- Six (6) 220/1/50 power sockets
- One (1) 530-litre Refrigerator.
- Mixer, microwave range, rice cooker.
- Three (3) 415/3/50 power sockets.
- Deckhead and wall shall be of stainless steel lining.
- One industrial dishwasher

#### 15. Dry Provision Store

The dry provision store is to be fitted with stainless steel shelves on steel bearers. Provision store should be of adequate size to enable storage of provisions for a period of 28 days. Dry provision store to be air conditioned.

#### 16. Cool & Freezer Rooms

The cool & freezer room are to be situated as shown on the General Arrangement. They are to be cooled by units as per description. Deck, sides and deck head are to be insulated with foam plastic respectively. The internal finish will be covered by plywood with stainless steel for side and ceiling. Thickness and type of insulation are to be in accordance with the recommendation of the manufacturer for the refrigeration machinery, and approved by owner's representative. Freezer & Chiller should be of adequate size to enable storage of perishable provisions for a period of 28 days.

The door is to be stainless steel insulated door with door alarm.

Freezer room has self-defroster.

Temperature range	- 18°C for freezer room
	+ 4°C for cool room

#### 17. Laundry

This compartment situated on the tween deck, is to be fitted out as follows:

- Two (2) power points, 220/1/50
- One (1) extractor fan
- Three (3) 10 kg industrial type washing machine
- Three (3) industrial type Dryer of approx 10kg capacity.
- One (1) stainless steel tub
- Four (4) steel lockers
- Two (2) ironing board
- Two (2) electric iron

#### 18. A/C Room

One (1) air conditioning handling unit to serve accommodation and wheel house. It is to be located as per the General Arrangement Plan.

Lighting, ventilation ducts and scupper pipe to be provided.

#### 19. Deck Store

The deck stores situated on various deck levels are to be fitted out with timber shelves on steel frames. Lighting and natural ventilation to be provided.

#### 20. Boson's Store

The boson's store is to be fitted out with timber shelves for stowage of general stores, etc.

#### 21. Bow Thruster Compartment

This compartment is to be fitted with bow thruster machinery with suitable forced ventilation. Flooring to be 5mm steel chequer plates.



## 22. Chain Lockers

The compartments are to be fitted with bilge suction and/or eductor system for drainage.  
A false bottom of 25mm thick perforated mild steel plates is to be fitted in each locker.

## 23. Engine Room

The engine room is to house the main engines, generators, pumps and compressors etc. All machinery and equipments are to be positioned in appropriate locations to facilitate easy access for operation and maintenance. Machinery with exposed moving parts which constitute a potential danger to personnel shall be protected with screens, handrails or both. All wet and / or slippery areas shall be provided with non-skid walking surfaces.

Engine store shall be provided with bins or shelves, or other storage means.

Steel chequer floor plates 4.5mm are to be laid.

## 24. Cement Tanks Compartment

This compartment is to be fitted by four (4) units of 2000ft<sup>3</sup> each cement tanks of 80 psi working pressure. Forced ventilation and 5mm steel chequer plates passage are to be fitted.

Maintenance platform with safety railing and vertical ladder should be provided for servicing the bulk system air actuated valves

## 25. Thruster Machinery Compartment

Thruster machinery compartment is to be fitted with necessary steering machinery.

Forced ventilator and communication are equipped in this room.

Rudder propeller angle is shown by indicator plate.

Thruster compartment to have adequate ventilation to meet relative climate.

## 26. Emergency genset compartment

The emergency genset is to be installed as per SOLAS.

## SECTION 4 - PAINTING & CATHODIC PROTECTION

### 1. Painting General

All steel materials to be grit blasted to Sa2.5 and prime coated prior to cutting for construction. Rusted surface of existing steel hull, if any, to be power brush cleaned and touched up with primer coating before applying following painting scheme. Care must be taken to ensure the surfaces are free of all kinds of contamination. All paint coatings will be applied to the satisfaction of paint manufacturer. All paints shall be of Jotun, IP or equivalent. Shop primer to be 25  $\mu$  m(Microns) dry film thickness (DFT).

### 2. Painting Schemes

Paint supplier to be Jotun or International Paint (IP) and to follow Paint Specification and colour Scheme as supplied.

Following specifications based on coating system are for guidance. Other specifications of equal standard would be acceptable.

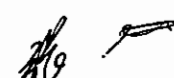
All coatings to be applied to the satisfaction of the attending Jotun or IP representative.

Galvanised pipes are to be etched-primed and then top-coated with colour code.

Painting schemes and color should be approved by owner. Anti-fouling protection should be 3 years warranty.

### 3. Cathodic Protection

Appropriate numbers and size of zinc anodes are to be bolted to the immersed loaded hull and rudder propeller nozzles and inside of the sea chests. Cathodic protection to be adequate for three (3) years under normal working condition. Current density calculations to be submitted for approval.



## SECTION 5 - PLUMBING & PIPING

### 1. General

All pipes are to be arranged according to good marine practice with sufficient bore and thickness for the purpose intended. They are to be well clamped to the ship's structure and to have minimum number of bends. Approved type of bulkhead fitting is to be used where piping penetrates a watertight or oil tight bulkhead, deck or tank top. Expansion bends are to be fitted where necessary to avoid damage due to expansion or movement of the structure. Mud boxes, strainers, filters and valves are to be arranged according to the JIS/and classification's requirements.

All pipes of 15mm and over to be lap welded with flanged connections. Those below 15mm are to be screwed with unions or similar. All pipe runs to be a maximum of 5 metre lengths with flanged connections to facilitate easy removal & repairs.

Bilge, scupper, fresh water, cargo lines and fire lines to be hot-dipped galvanized.

Fluid pipes with flange are never allowed to be installed above switchboard.

In general, Piping is designed fluid flow speed under 3.5m/sec.

Before starting up of any system, coarse gauze, slave filters should be fitted on the suction side of the pumps. These should be inspected and cleaned prior to sea trials and only removed on delivery. No pipe breaks over distribution panels and no fluid pipes in above main switchboard if necessary.

Any pipework above main and auxiliary engines to be flanged to enable pipework to be removed should repair work be required to the engines.

### 2. Bilge System

Bilge pipes to be hot-dip galvanised after fabrication, are to be arranged with valves, strainers, mud boxes, manifolds and pumps in accordance with the piping drawing to meet the classifications requirements. Suctions wells are to be fitted to the following compartment

- Bow thruster room
- Cement tanks compartments
- Engine room
- Thruster / stern machinery room

Filling, suction and sounding are to be fitted to tanks as indicated in piping drawings.

Docking plugs to be flushed with external shell plating and marked on the bottom plate outside with weld beads. Two (2) docking plug spanners to be supplied.

The chain locker bilges are arranged to be pumped out using eductor system.

### 3. Fuel Oil System

The ship's oil fuel bunkers are to be arranged as shown on the General Arrangement Plan, with one bunker arranged as an overflow tank.

Fuel oil filling connections to be arranged port and starboard on the main deck. Save all box under bunkering valves. The sound powered telephone are to be enclosed in a

weathertight box. High level alarm (audio and visual) for all fuel oil tanks are to be indicated at the bunker station(s). Fuel oil fill lines to be fitted with sampling cocks.

The oil fuel piping to be arranged so that the transfer pump may draw from and discharge to any of the bunker and discharge to the daily service tanks.

Fuel lines to be lead to just above tank top.

A spring loaded draw-off cock to be fitted to daily service tank. Drip tray with drain line to dirty oil tank to be fitted underneath.

Daily service tank to be fitted with an air/overflow pipe led into a common main, as far as practicable, which is to discharge into the overflow tank. Overflow sight glass are to be fitted for each daily service tank. Audio and Visual alarms to be fitted.

A single air pipe is to be arranged to the overflow tank and is to be terminated under the forecastle deck bulwark with approved vent head with heavy duty stainless steel flame arrestor screen to be installed.

Drip trays of sufficient coaming height to be fitted in way of pumps and strainers, and drained to dirty oil tank.

All drain from drip trays to be drained to dirty oil tank. Hydraulic operated closing device to be installed for the FO quick closing valves. type to be fitted on fuel oil tanks subjected to tatic head.

Remote manually operated closing devices for all oil valves are to be provided as per Rules and Regulation.

F.O. Purifier to be provided to draw from storage tank and discharge to Day tanks, in addition to circulating day tanks. Sludge to be discharged into dirty oil tank. Trolley beam or lugs to be provided for the near purifiers for cleaning of bowls. Purifier to be of sufficient capacity to maintain service and level during full steaming and generator loading.

#### 4. Lube Oil System

Lube oil pipes of seamless black mild steel are to be arranged in accordance with engine Manufacturer's recommendation and to meet Classification requirements. Lube oil storage tank is to be provided in engine room with filling pipe fitted on main deck. The main and auxiliary engines are supplied with built-in lube oil pumps.

Engines/Oil Tank breather pipes shall be fitted with oil mist traps with proper drainage and devices to prevent spillage.

Hand pump to be provided for lube oil storage tank. system.

Fuel oil/lube oil tanks glass gauge valves are to be fitted with self closing valves.

5. Cooling System (main and aux.)

The main and auxiliary engines are to be seawater cooled and each engine is to be equipped with engine driven F.W. and lube oil pumps, and lube oil cooler. The cooling pipes are to be arranged in accordance with engine manufacturer's recommendations and to meet Classification requirements.

6. Exhaust System

Spark arrester type exhaust silencers & expansion bellows to be provided for each main and auxiliary engine. Exhaust pipes and silencers are to be suitably insulated with heat resisting "asbestos free" insulation material and covered with sheet steel secured with rivets. Silencers to be well supported by brackets and resilient mountings.

7. Hydraulic System

The hydraulic piping of solid drawn steel or HP flexible hose of approved type for the steering propeller and bow thruster unit are to be arranged in accordance with the manufacturer's recommendations and to suit the classification requirements.

A hydraulic storage tank of adequate capacity with necessary fittings to be fitted in the thruster compartment with a adequate capacity and a filling line to main deck.

A motor driven gear pump with a fine filter is to be provided for transferring oil from the storage tank to the gravity header tank

8. Fire & Wash deck Service

S.W. for the fire fighting and wash deck service is to be supplied from the G.S. and fire pump to hydrants fitted on the various deck levels and engine room.

9. F.W. System

A cold and hot FW piping system of copper pipe is to be fitted for drinking and washing purposes. F.W tanks are to be arranged as shown on the General Arrangement drawing.

Hot water should be with circulation pump good for 50 persons

Water is to be supplied to the accommodation and engine room through an automatic pressure set installed in the bow thruster compartment. An emergency stand-by pump is to be connected to the system. Two (2) filling/discharge connections on the main deck are to be fitted. Both Fill and discharge lines to be fitted with sampling cocks. One (1) fresh water cargo pump with the manifold and valves etc. are to be arranged to transfer water to the deck or from one tank to the other.

All hot pipe to be lagged.

10. Sanitary Fittings

- 1) Washbasin : white vitreous china, cold/hot water supply. Taps are to be chromed plated
- 2) Showers : light colour ceramic tiled with 9.5 mm hot & cold water

screw down taps.

- 3) W.C. : white vitreous china with plastic seats and lids.
- 4) Galley sink : Stainless steel double bowl with cold/hot F.W. supplies.  
Chrome plated taps.

#### 11. S.W. Sanitary System

S.W. sanitary pipes of galvanised steel are to be arranged with valves. S-trap, scuppers and pressure set in accordance with good marine practice.

#### 12. Bulk Cement System

Cement System General:-

The system is designed for cement and chemicals with a maximum specific gravity of 2.5. Loading/discharge station arranged at two locations on main deck, midship and aft locations and on port and on starboard sides. Loading and discharge lines to be separate.

Loading/discharge operation to be from Central Control Panel to be located in wheelhouse. 5" diameter quick couplings are to be provided complete with dust caps.

Ventilation through two common lines:-

Cargo Capacity : Approx. 8000cu. ft total (226M<sup>3</sup>)  
Operation Pressure : 80 psi  
Four (4) off vertical cement tanks.

All tanks rated for 80 psi working pressure

Test pressure 1.5 times working pressure.

To complete with aeration system hatch, lifting eyes, legs and pipe connection for discharge. Fill and vent lines and air supply plus high level indicators, pressure valve and safety valve which can be preset at any level between 40-80 psi.

The four (4) cement tanks shall be individual filled and vented. The common discharges to be located one (1) at port amidships, one (1) at port aft, one (1) at starboard amidships, one (1) at starboard aft.

The bulk system shall be remote operated from the wheelhouse with the exception of butterfly valves (manual operated) located on the main deck. Deck connection shall be of quick connections type, quick couplings with cap of 130mm (5 inch) for cement.

One (1) remote control stand for four (4) tanks operation, having two purge valves and two (2) compressor stop buttons incorporated. It shall be located in wheelhouse.

Compressors:

2 off electrically driven compressor, sea water cooled.

Capacity : 20m<sup>3</sup>/min F.A.D.  
Working Pressure : 80 psi

- After coolers complete with moisture separator and auto drain trap, all to manufacturer's recommendation.

- Electric motors and compressor units mounted on common skid.

Receiver:

2 off vertical air receiver each of approved capacity complete with safety valve, gauge and drain trap, butterfly valves and fittings. 2 air dryer should be provided in this system..

Air piping from compressor to tanks to be as straight as practicable to eliminate condensation collection points.

### 13. Compressed Air System

The main engines are to be air started. The compressed air pipes of solid drawn black mild steel are to be arranged with air bottles, valves, and pressure gauges in accordance with engine manufacturer's recommendations and to meet classification requirements. There are two (2) air bottles for engine starting and general service duties.

Two (2) ships starting air compressors to be installed, one duty, one standby.  
The compressed air system should meet classification requirement.

### 14. Cargo Piping System

For Fuel oil, Fresh water and drill water cargo Fill/discharge points should be midship port and stbd and aft port and stbd.

For Liquid mud /brine/base oil and Brine cargo fill/discharge point only on aft port and stbd.

The combined filling and discharge deck fittings are to be colour coded. Colour codes to be advised by Owner.

The systems to cater for:-

- Cargo Freshwater
- Cargo Oil
- Drill water
- Dry bulk
- Liquid Mud / Brine
- Base oil

Deck terminations to be fitted with brass type quick couplings. Butterfly valves to be fitted adjacent to quick couplings with dust cap and SUS linked chain.

### 15. Scuppers & discharges

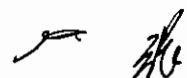
Greywater Discharges from washbasins, showers, sinks and internal scuppers are to be grouped into a common cross main to discharge to sewage treatment plant. Discharge from W.C. to be led to a sewage treatment plant adequate for 50 persons.

Scuppers from the refrigeration spaces are to be led to overboard. A scupper from the air-conditioning compartment is to be led overboard via a storm valve.

50 mm scuppers to be fitted in toilets, laundry spaces and galley. All scuppers to be fitted with removable steel grating. Trapped scuppers are fitted as per detail drawing.

Discharges and traps generally to be as follows:-

Showers : 50 mm with P-trap



Washbasins : 32 mm with deep seal bottle trap  
Galley sink : 65 mm with water trap and stainless steel basket strainer to be fitted.  
W.C.S. : 100 mm

Cleaning plugs to be fitted as may be required.

Open superstructure / deckhouse decks to be drained by 50 mm scuppers.

No take down flanges to be fitted in way of accommodation / mess room / provision store.

#### 16. Refrigeration System

Refrigeration plant of R404A system direct expansion type, water cooled, electrically driven, to be installed complete with all necessary accessories.

Two (2) compressors complete with condensing unit to be fitted, one acting as 100% standby for entire shipload.

The plant is to maintain temperatures of -18 degrees C and +4 degrees C in refrigeration store spaces.

Dual type thermometers to be supplied and fitted for each chamber with dial mounted on outside of chambers.

Refrigerant pipes to be seamless copper tubings and outside of cold chambers they are to be lagged.

Refrigerating system to be of the fan / coil blower type and to be automatically controlled, c/w auto defrost cycle; and automatic "dumping" and shut down valves for changeover of the compressors.

Scupper pipes to be fitted draining to main scupper lines and led to overboard.

No other pipes to pass through cold rooms, except refrigeration lines.

#### 17. Air Conditioning

An air conditioning plant for cooling and heating to be fitted to serve accommodation, galley (spot cooling) and wheelhouse and all living spaces within Accommodation area.

The system shall be arranged for automatic operation and manual adjustment damper and to have 0-50% circulation capacity, providing that the cooling unit shall be designed for 15% fresh air and 85% recirculation and to comply with the following conditions

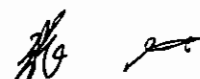
Design Conditions as follows:

Outside : 50 degrees C, 100% R.H.  
Inside : 22 degrees C, 50% R.H.  
Sea water : 36 degrees C  
Fresh air intake : 30%

Air conditioning unit to be S.W. cooled with cooling pump located in engine room.

Ducts to be fabricated from galvanised sheet metal and insulated by 25 mm thick glass wool.

To be concealed behind deckhead lining.





Fire dampers to be fitted where necessary, accordingly to SOLAS.

Return Air from cabin or compartment to be through louvered grille in the lower part of the door.

Two (2) compressors c/w condensing units with 15% fouling allowance, each sized for 100% capacity to be parallel fitted.

The GS pump shall serve as standby to the air-con S.W. cooling pump. Interlock shall be arranged via flow switch to protect compressors.

Emergency stop push button of engine room ventilation fan is located in wheelhouse.

#### 18. Bilge & Ballast System

Bilge main and suction lines are to be in accordance with Classification requirement.

Mud or strum boxes are to be fitted in the system where applicable in accordance to Rules requirements. Mud and strum boxes to be galvanised. (hot dipped) Filling, suction and discharge pipe to be fitted to tanks. Suctions to be fitted as required by Classification.

Upon completion the systems are to be pressure tested to Classification requirements.

Care is to be taken to ensure drainage to bilge suction and scuppers.

#### 19. Air & Sounding Pipes

Sounding pipes are to be fitted to tanks. Cofferdams and void spaces as required by Classification.

Double bottom tanks are to be sounded from the engine room. Spring loaded sounding cocks or equivalent to be fitted.

Nameplates of brass engraved with the tank number and purposed to be fitted.

Striking plates or equivalent to be fitted at bottom of sounding pipe.

Air pipes terminating on deck with vent heads to have float ball valves. Air pipes for loose tanks to be terminated on top of the respective tank.

## SECTION 6 - DECK MACHINERY & EQUIPMENT

### 1. General

All deck machinery and equipment are to be supplied and installed to meet classification requirements as applicable.

### 2. Anchors, Chain Cable & Mooring Line

The anchors, chain cable and mooring line are to be supplied in accordance with the Classification's requirements

For guidance, they are as follows:-

- |               |   |   |
|---------------|---|---|
| Anchor        | : | 2 x 2640kgs Stockless Bower Anchors.<br>OR 2 x 1980kgs high holding anchors.    |
| Chain cable   | : | Two (2) length of 467.5m x 46 mm dia., (grade U2) stud link chains.             |
| Mooring lines | : | 4 x 170m long mooring ropes of minimum 201KN breaking strength (polypropylene). |
| Tow line      | : | 1 x 190m long towline of min. 518 KN breaking strength (polypropylene).         |

### 3. Anchor Windlass

An electro hydraulic anchor windlass suitable for specified diameter cable complete with two warping heads is to be independently clutched. It is to be securely mounted on fabricated steel seating on forward of forecastle deck above the chain lockers. Chain pipes, cable stoppers and hawse pipes are to be arranged to suit.

Capacity - 13 tonnes at 18m/min for 46 mm chain

### 4. Capstans

Two (2) units electro hydraulic capstans of capacity 10 tonnes 25m/min variable speed control to be located aft of main deck.

### 5. W.T. Hatch

All WT hatches as shown on General Arrangement to be fitted according to classification's requirements.

Counter balance weights to be provided for boson store and engine room emergency escape and shall be fitted latch and locking devices from inside.

### 6. Bollards & Mooring Posts

Double mooring bollards of 300 mm N.B. heavy pipes are to be fitted on main and upper forecastle deck as shown in the General Arrangement.

#### 7. Hand & Guard Rails

To be fitted around wheelhouse top, bridge, deck, forecastle deck and else-where, as indicated on General Arrangement. To be fitted to ladder ways and round ladder way openings.

Storm rails of 32 mm diameter pipe or chrome-plated tubings inside accommodation passage to be provided.

Railings with hand grips of 32 mm galvanised pipe, middle and bottom rails to be 19 mm diameter solid rod.

Stanchions to be 65 mm x 12 mm flat bar, spaced approximately 1200 mm and welded to deck.

#### 8. Funnels & Navigation Masts

Two (2) funnel are to be arranged as shown on the General Arrangement drawing. A hinged water tight access door or portable panel is to be fitted on the funnel for maintenance accessibility. A cross piece is to be fitted on top, joining the funnels together and act as platform for mounting and operating the fire monitors. Vertical ladder is to be arranged from wheel house top to this platform. Main mast is to be fitted to take navigation lights and communication equipment and be strongly braced / supported by pipes.

#### 9. Fenders

320x25 steel plate is to be welded on sheer strakes as per General Arrangement drawing. Aircraft tyres fitted to side and stern. Fwd side to be tractor wheel.

#### 10. Covers for Deck Equipment

Canvas covers are to be provided for compasses, searchlights, monitors and winch consoles installed at exposed weather decks.

#### 11. Deck Sheathing

Hardwood Sheathing of 75 mm (3") thick wood on aft main deck is to be fitted.

#### 12. Mooring Hole

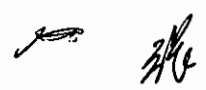
Six (6) fitted on upper forecastle deck.

#### 13. Tugger Winches

Two (2) electro hydraulic tugger winches of 10tonnes at 24 m/min to be installed as shown on the General Arrangement. Each winch is to be complete with one (1) wire drum and one (1) warping head c/w 250 m x 19 & 22 mm dia. wire respectively.

#### 14. Lashing lugs

20 of 10t SWL. lugs to be arranged on main deck. The size of double plate and weld thickness suffice for 10T SWL.



15. Deck Connections (P & S) – Midship & Aft.

- |                        |   |  |
|------------------------|---|--|
| a) Cement              | - | Brass coupling with dust caps, female 13 cm<br>(1 common filling and 1 common discharge) |
| b) Drill water         | - | Female 10 cm   |
| c) Cargo potable water | - | Female 10 cm   |
| d) Cargo fuel oil      | - | Female 10 cm   |
| e) Liquid mud          | - | Female 13 cm   |
| f) Sewage              | - | Connection to meet Marpol 73/78  |
| g) Dirty oil           | - | Connection to meet Marpol 73/78  |
| h) Base oil            | - | Female 10 cm   |

For dry bulk, discharge points at port and starboard midship and aft to be provided.  
For liquid mud/Base oil, discharge point at aft, port & starboard side to be provided.  
For F.O., potable water and drill water, discharge points at midship and aft, port & starboard side to be provided.

16. Deck Crane

One (1) unit marine crane to be installed on main deck aft of accommodation.

The crane capacity and its fixtures to be as follows :-

Load S.W.L.	:	3.0 Tonnes
Maximum Outreach	:	10.0 M Horsepower
Required	:	According to maker

17. Reefer Sockets.

Eight (8) pieces of waterproof electrical sockets to be located aft of accommodation on main deck.

Reefer Sockets to be supplied as follows :

1\*415v/63amps/4pins

5\*415v/32amps/4pins

2\*220v/32amps/4pins

18. Drill pipe deck mounted stanchions to be provided on main deck.

## SECTION 7 - SAFETY & NAVIGATION EQUIPMENT

### 1. Life Saving Equipment

All life saving equipment is to be in accordance with Classification and Government Authority requirements for all Ocean Going Vessel with a total complement for safety/rescue operation.

The Life saving equipment shall include at least the following:-

i) Life rafts:

Six (6) inflatable life rafts to SOLAS requirements, each certified twenty-five (25) men capacity. Life rafts are to be stowed in cradles for quick sideway launching. All to be SOLAS approved and capacity should be to suit SOLAS requirement.

ii) Lifebuoys:

Total eight (8) lifebuoys of approved construction of which four (4) lifebuoys with 90 Ft buoyancy lifelines, and four (4) lifebuoys with 90 Ft buoyancy line and self igniting electric lights (two (2) smoke signals of the latter).

All to be SOLAS approved.

One (1) of the lifebuoy to be positioned close to stern.

iii) Lifejacket

Synthetic type lifejackets with reflective tape, whistle and light, floatation foam and conform to SOLAS standard.

iv) Immersion Suits:

SOLAS approved type of immersion suits supplied and store in locker/wardrobe.

v) Pyrotechnics:

One (1) line throwing apparatus.

Twelve (12) parachute distress rockets.

Two (2) orange smoke.

Two (2) self igniting light.

vi) Rescue Boat:

One (1) SOLAS approved diesel powered Rescue Boat capable of carrying 6 persons.

SOLAS approved rescue boat davit to be provided for launching over starboard side.

A portable VHF radio shall be provided.

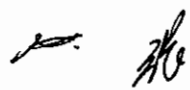
vii) Work Vest:

Six (6) in number.

viii) Retro Reflective Tapes:

Life Saving appliances are to be fitted with reflective tapes.

ix) Scrambling Net:



Two (2) number one(1) on each side of the Rescue Zone. A nylon net reaching the waterline (approx. 2m x 6m long wide, made of 24 x 22 mm p. rope with mask about 200mm by 200mm).

- x) Boat Hooks:  
Two (2) boat hooks with approx. 2 m handle.
- xi) Oxygen Resuscitator:  
One (1) set of oxygen resuscitator with oxygen cylinder in carrying case plus one (1) spare oxygen cylinders.
- xii) First Aid kit:  
At least 1 x 25 men first aid kit.

## 2. Firefighting Equipment (internal)

Firefighting equipment is to meet Classification and relevant Government Authority Regulations.

Generally all in accordance with the following:- i)

### Fireman:-

A fireman and twelve (12) hydrants are to be installed, eight (8) on various deck levels and two in engine room. 15M canvas fire hose c/w brass coupling and nozzle is to be supplied and stowed alongside each hydrant in a protective box. All nozzles to be dual jet/spray type and incorporating shut-off type. International shore connection is to be fitted. The canvas hoses to the coupling and/or nozzle to bind with soft copper wires.

### ii) Fireman's Outfit:-

Four (4) complete sets (each contained in its own separate storage unit) of fireman's outfit are to be provided, comprising the following:-

- One (1) protective clothing (Extra Large Size)
- One (1) breathing apparatus - oxygen tank and mask
- One (1) fireman's axe
- One (1) safety lamp of portable battery type
- One (1) set of gloves and boots Extra Large size
- One (1) length of lifeline

### iii) Portable Fire Extinguishers:-

Fire extinguishers as required by the classification and Government Authority are to be supplied and installed. For guidance, they are as follows:

Position	Type
Wheelhouse	4.5 kg, dry powder
Forecastle deck accommodation	4.5 kg, dry powder
Main deck accommodation	4.5 kg, dry powder

Galley	4.5 kg, dry powder
Radio station	4.5 kg, dry powder
Engine room	45 lit, foam
	4.5 Kg, dry powder
Bow thruster compartment	4.5 kg, dry powder
Mess room	4.5 kg, dry powder

A complete set of replacement spare are to be supplied by builder.

iv) Fire Blankets:-

Two (2) off to be provided in Engine room and galley respectively.

v) Fire Axes:-

One (1) off.

3. CO<sub>2</sub> System

A full flooding CO<sub>2</sub> system consisting gas bottles c/w quick operated valves and auto alarms is to be provided for engine room. The CO<sub>2</sub> bottles to be stowed inside a separate compartment. Operation is to be manually activated in CO<sub>2</sub> room and with remote near engine room entrance (outside).

4. Emergency Fire Pump

One (1) fire pump of capacity 35m<sup>3</sup>/hr 50 m head to be installed to meet classification/ government authority approval.

5. B.A. Recharging Compressor

One (1) electric driven Breathing Apparatus Recharging Compressor of capacity 200 litre/min @ 200 Bar to be installed to meet Classification requirement of FIFI Class1.

6. Paintlocker

Water mist protection is to be installed for the paint locker.

## SECTION 8 - MACHINERY

### 1. General Requirement

Two (2) independent propulsion plants, each unit shall consist of:

One (1) Main Engine - Caterpillar, Niigata or similar to be owner approved.

One (1) Rudder Propeller with fixed pitch – Schottel,, Niigata or similar to be owner approved.

The entire propulsion plant is to be designed, constructed and installed according to the rules and requirements of Classification Society, IMO and National Societies.

Exhaust gas emission limitations, according to IMO, shall be noted as well as structural measures for sea-going vessels for the prevention of marine pollution by oil, sewage and garbage in conformity with MARPOL 73/78.

Main and auxiliary engines to conform with Marpol 73/78 Annex VI

#### 1.1 Acceptance, installation and calculation

The installations of main and auxiliary machineries including their accessories are to be easily accessible in order to allow maintenance and repairs and carried out with a minimum expenditure for effort and time.

The minimum life expectation of all machinery components according to part of this specification shall be observed.

Before installation on board, the important machinery shall be inspected and proved by Classification Society and the Owner at manufacturers test bed. The designed output shall be demonstrated during trial for several hours.

The following ambient data shall be used for design and material selection purpose, otherwise the required ambient data is to be mentioned:

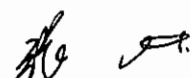
Air temperature            50 °C

Sea water                    36 °C

For re-cooling of machinery, the system shall be done only by fresh cooling water, providing that the temperature shall not be more than 38 °C

Air pressure                1000 mm bar

A torsional vibration analysis of shafting system together with P.T.O. for fire pumps shall be prepared by the engine manufacturer and to be submitted to the Owner after approval by the Classification Society.





Positive air pressure to be maintained in the Engine Room with all combustion machinery operation at its full power rating. Ventilation of the engine room and bow thruster room to be adequate for relative climates.

## 2. Main Engines

Two(2) single-acting, medium speed, four stroke, non-reversible, trunk piston type, marine diesel engines with exhaust turbo charging and charge air-cooled are to be provided. Complete engine cooling shall be provided by freshwater. Each engine is to be of compressed air-starting system.

Each engine to have minimum of 3000 PS and drive one (1) Fixed Pitch Rudder Propeller Unit.

The engine shall comply with the latest IMO requirement for NOx emission and shall be supplied with EIAPP certificate.

### 2.1 Cooling System

The cooling of engines is to be by fresh water cooling system and shall be done via heat exchangers with 15% fouling factor.

### 2.2 Starting Air Receiver

Two (2) sets of starting-air receiver with sufficient volume and necessary fittings shall be provided. Pipes and air bottles shall be designed according to the regulations. The pipes are to be of seamless steel pipes with suitable connection.

The control air is from the main air receivers via a reducer and moisture separator which are fitted on the receivers.

### 2.3 Starting Air Compressor

Two (2) sets of starting-air compressor, being air-cooled and electrical-driven type, shall be installed onboard. The capacity of each unit is to be according to the regulations and main engine maker requirement.

Compressor and motor shall be mounted on a common skid/foundation with resilient mounting.

### 2.4 Exhaust Gas System

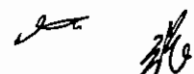
The system is to consist of the following elements:

Two (2) exhaust gas silencers, being able to suppress noise not less than 35 dBA and equipped with spark arrestor and suitable for oil field operation

Exhaust gas supports to be provided by flexible suspensions

Insulations to be equipped with galvanised steel sheet covering

Drains



## 2.5 Power Take Off (P.T.O.)

Each engine is to be provided with one (1) P.T.O. at front end of about 820KW to drive a fire pump via a step-up gearbox to match the RPM of the fire pump complete with isolating clutch and 1000KW generator. However fi-fi pump and generator can not run simultaneously

## 3. Manoeuvre and Control Equipment

Engine control console in engine control room

One (1) separate engine-manoeuving stand is to be provided and shall incorporated in control console which is to be fitted with instrument panels with all necessary temperature and pressure gauges, tachometer and etc. Emergency handling of main engines shall be provided according to Classification Society.

Control consoles in bridge

Forward and aft engine-manoeuving control console to be installed at the bridge and

fitted with all required instruments. Main engines shall be controlled remotely by electrical power from the wheelhouse including all safety features for safe operation of the vessel from the wheelhouse.

An integrated joystick control system is to be provided at both forward and aft control station to the Azimuth thrusters and bow thrusters etc. at both forward and aft control stations.

## 4 Bow Thrusters

Two (2) bow thruster units, with conventional tunnel thrusters of approved make and type to be fitted with a thrust of approximately 10.0 tonnes each and will be sufficient to meet D.P station keeping capabilities. (DP plot to be provided specifying this)

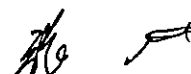
The units to be driven by an electric motor (about 600 KW) and complete with controllable pitch propeller, powered by electric power.

Control of both thrusters shall be from all control positions in wheelhouse.

## 5 Main Generators

The electrical power is to be supplied by three (3) diesel-driven generators of each 450kw 1500rpm 50HZ. Starting of engines is to be electrical system. All accessories shall be in accordance with the Classification Society.

Three Generators of 450kW each are to be designed for parallel operation and be able to be run simultaneously. The cooling of engines shall be done by three (3) heat exchangers.



The diesel engine and generator are to be fitted to a common foundation, which is to be resiliently mounted.

**Diesel Generators:**

Voltage: 415V, 3 phases

Frequency: 50 Hz

Output of each set: 450 KW

**Shaft generator**

Voltage: 415V, 3 phases

Frequency: 50 Hz

Output of set: 1000 KW

6 Emergency Diesel Generator

One (1) diesel-driven emergency generator with air-cooled radiator system and to be of electric-start type shall be provided in the Emergency Generator Room located on the main deck and to be readily accessible from the open deck.

The emergency gen-set room is to be well insulated and the generator is to be mounted on resilient foundations to minimize noise and vibration.

The capacity of generator is to be sufficient to supply all emergency and harbour loads as required.

Output: 80 KW (approximately)

Diesel oil service tank for the emergency generator set shall be fitted with high, low lead and cut off alarm is to be served by a electrical power pump. Filling line from the M.E service tanks to be provided.

Starting and stopping switch for the electric pump shall be located at the vicinity of the diesel oil tank in the emergency diesel generator compartment.

7 Fuel Oil and Lubricating Oil Pump

7.1 Lubricating Oil Pump

The following pumps shall be installed: Two (2) lubricating oil pump for stand-by.

All pumps are to have flange connections.

7.2 Fuel Oil Transfer Pump

Two (2) horizontal gear pump to be installed. Pump to have a cast iron body with carbon steel rotor and shaft. Pump to have a capacity of 20 M3/hr against a discharge head of 20m

Pump is to be directly coupled to a 3 phase, 50 Hz, 415volts motor and mounted on a common base plate.

Pump to have one (1) remote stop switch outside engine room.

### 7.3 Sludge Oil Pump

One (1) sludge oil pump of 5 M3/hr at 29M head shall be installed. Waste oil pump is to be connected to shore line manifold at both starboard and port sides

This Pump is also to be used as a bilge pump with necessary piping supplied

## 8 Water Pump

### 8.1 Bilge and Ballast Pump

The following ballast pump shall be provided:

Two (2) self-priming bilge and ballast pumps of electric motor-driven type

- Capacity: 80 m3/h at 70M head for ballast pump
- Capacity:60 m3/h at 50M head for bilge pump
- Suction and discharge pressure gauges to be provided.
- Casing : Cast iron
- Shaft : Stainless steel
- Impeller: Bronze

The following eductor shall be fitted onboard:

- One (1) bilge eductor for chain locker
- Capacity: 5 m3/hr

### 8.2 General Service & Fire Extinguishing Pump/Emergency Fire Pump

- A general service and fire main system to be provided with one (1) self-priming pump with connections to the following services:
  - Fire hydrants
  - Bilge ejectors
  - Standby for : main engines, cement compressor after-coolers, air-conditioning and refrigerating plant cooling.
  - Capacity : 80 M3/hr at 70M head
  - One (1) electric driven emergency fire pump is to be arranged and located outside the engine room in accordance with the regulations
  - Capacity 35 m3/hr at 7.0 bar.

### 8.3 Freshwater Cooling Pump

The following pumps are to be provided for the main engines:

- Two (2) engine driven fresh water cooling pumps (high temperature)
- One (1) reserved fresh water cooling pump (high temperature) for both main engines (spare)

### 8.4 Sea water cooling Pump for main engine

- Two engine driven sea water cooling pump
- One reserved sea water cooling pump for both main engines (spare)

## 9 Fuel Oil Treatment

Lubricating system for the propulsion plants shall be based on wet sump lubrication and to include oil pumps and filter

### Fuel Oil Purifier

One (1) set of fuel oil purifier of self-cleaning and self-discharging type to be provided.

Capacity : to meet engine maker's requirements

A built-on double pump, pre-filter and regulating valves shall be provided and fitted with alarm for broken water-trap.

## 10 Supply and Drainage Plant

### 10.1 Freshwater/Seawater Hydrophore Plant

#### Freshwater Hydrophore Plant

One (1) freshwater hydrophore plant of 5.0 M<sup>3</sup>/hr at 35M head complete with 2 KW motor, 2800 RPM, 415/3/50 and one (1) pressure tank of about 300 litres with maximum working pressure and pressure relief valve.

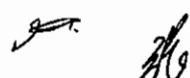
#### Seawater Hydrophore Plant

One (1) salt water hydrophore plant of 5.0 M<sup>3</sup>/hr at 35M head complete with 2 KW motor, 2800 RPM, 415/3/50 and one (1) pressure tank of about 300 litres with maximum working pressure and pressure relief valve.

#### Hydrophore Plant Standby Pump

One (1) hydrophore plant standby pump complete with 1 KW motor, 2800 RPM, 415/3/50 with maximum working pressure 35M head with pressure relief valve and connected to freshwater and seawater system as standby. All pump to have:

- Casing – Cast iron
- Shaft – stainless steel
- Impeller – bronze



10.2 Freshwater Maker

Two (2) set RO freshwater maker to be provided mounted on common skid. Sand filter to be provided for each water maker.

□ Capacity : 2x10 tonnes/day

10.3 Sewage Holding and Treatment System

Sewage shall be treated in a self-contained compact sewage treatment plant in order to render it biologically harmless. The plant is to be suitable for 50 persons. Chloride discharge must below

10.4 Oily Bilge Water Separator

One (1) oily bilge water separator, having capacity of 1.0 m<sup>3</sup>/hr with oil content less than 15 ppm, is to be provided with matching capacity pump. Using gravity technique to separate fuel through plate pack able to disassemble for cleaning with oil content and bilge alarm to monitor the unit, according to MARPOL Standard.

11 Machinery for Cargo System

11.1 Mud Pump for Liquid Mud (S.G. 2.5)

Two (2) mud (liquid mud) discharge pumps of 75 M<sup>3</sup>/hr @ minimum 90M head pressure. Either pump can be used as circulation pump. Pump to be centrifugal type or equivalent. RPM shall be less than 1500 rpm. Two (2) remote control emergency stop switches shall be provided, one in the wheelhouse and the other on main deck.

Agitator with necessary power and capacity for internal liquid mud circulation to be provided for each tank.

One observation tube with screw cap, 100mm diameter is to be provided on the man cover

11.2 Fuel Oil Cargo Pump

Two (2) gear pumps or equal to be provided, having a capacity of 150 M<sup>3</sup>/hr at 80M head. Two (2) remote control emergency stop switch to be provided, one (1) in the wheelhouse and the other on main deck.

11.3 Drill Water Pump

One (1) self-priming centrifugal pump to be provided, having a capacity of 100 M<sup>3</sup>/hr at 80M head. Two (2) remote control emergency stop switch to be provided, one (1) in the wheelhouse and the other on main deck.

11.4 Fresh Water Cargo Pump

One (1) self-priming centrifugal pump to be provided, having a capacity of 100 M3/hr at 85M head. Two (2) remote control emergency stop switch to be provided, one (1) in the wheelhouse and the other on main deck.

11.5 Cement Compressors

Two (2) air compressors, 415/3/50 of 20.0 M3/min, each at 80 psi working pressure c/w air filter. Compressor shall be provided with water separator and auto draintrap. Two (2) remote control emergency stop switch to be provided, one (1) in the wheelhouse and the other on main deck.

11.6 Flow meter

F.O. flow meters with local read-out for main engines to be installed. Cargo F.O, F.W. and drill water flow meters to include remote indicator and printer on bridge.

Flow meters to be calibrated and certificate issued by an authorized authority to greater than 0.5 % accuracy.

11.7 Base oil system

One base oil pump Capacity 35 m3/hr at 7.0 bar can be used for discharge base oil to platform. Loading is by shore pumps. All pipe work to be designed and installed accordingly.

12 Engine Room Construction and Inventory

12.1 Flooring in Engine Room

Steel floor plates are to be of stud plates or ribbed plates with minimum thickness of 5mm, and shall be laid on a welded steel angle bar substructure.

12.2 Stair, Ladder, Railing in Engine Room

All designs and constructions of the above mentioned items are to be made according to rules and regulations as well as international standard. All stairs, ladders etc to have hand railings fitted both sides.

12.3 Funnel Arrangement Inside

Exhaust gas pipes shall be fastened by elastic holders and insulated with calcium silicate and finished with Galvanized sheet according to regulations.

12.4 Lifting Lug in Engine Room

Lifting lugs, load tested and certificates issued, suitable for use of chain blocks are to be fitted at the following positions:

- ☐ One (1) trolley beam above each main engine c/w sliding chain block
- ☐ Two (2) points above each generator
- ☐ One (1) point above each gearbox
- ☐ Two (2) point above each intermediate shaft
- ☐ One (1) point above each pump
- ☐ One (1) point above each purifier
- ☐ Two (2) point on the outside of the hull and adjacent to each propeller

## 12.5 Workshop Equipment

The Engineer's workshop is to be fully equipped with the following equipment:

- ☐ Two (2) 10-ton chain blocks
- ☐ One (1) steel work bench with adjustable light and drawers & lockers with padlocks under the engine room
- ☐ One (1) 150 mm vice mounted on the workbench
- ☐ One (1) tool display board
- ☐ One (1) pedestal grinder with double head
- ☐ Two (2) electric portable drill
- ☐ One (1) complete set of assorted hand tools for general maintenance
- ☐ Three (3) steel sounding Tapes for F.O. and F.W.
- ☐ One (1) portable electric welding machine not less than 200 A
- ☐ Two (2) electric hand inspection lamp with 10 meters wandering leads
- ☐ Two (2) keys for sounding pipe screws plugs
- ☐ One (1) pair of plate shears
- ☐ One (1) bench mounted drilling machine not less than 13 mm drill

The boatswain's workshop is to be fully equipped with the following equipment:

- ☐ One (1) tool display board
- ☐ One (1) pedestal grinder with double head
- ☐ Two (2) 1 ton and 1/2 ton chain blocks each
- ☐ One (1) 5-ton chain block



## SECTION 9 - ELECTRICAL

### 1. General Installation

Electrical apparatus and wiring system are to comply generally with American Bureau of Shipping requirements. All electrical fittings used to be of good quality and suitable for tropical and marine environment at an ambient temperature of 50 deg.C.

Electrical cables shall be properly routed and grouped according to applications as far as practical and bundled in such a way that will not cause overheating of any cable in respect to the others in the group.

### 2. System of Supply

415 volts, 3 phase, 50Hz - for power (motor)

220 volts, 1 phase, 50 Hz via step-down transformers - for general lighting and navigational aid equipment, communication, etc.

24V DC - for alarms, radio and navigation aids, fire and general alarm, emergency lighting.

### 3. Power Supply

#### a) AC System

i) The electrical generation plant on board this vessel comprises;

3 x 450kw 50Hz generators. The auxiliary diesel-engine driven alternator sets are able to run in paralleled and continuously when required. The generator sets must therefore be suitable for paralleled operation and must be completed with necessary control kits for parallel operation and load sharing in proportion to their capacity.

2 x 1000kw 50Hz shaft generator driven by main engine PTO. It is not demanded to run in parallel continuously with anyone of 450kw generator. However, the momentary parallel running with anyone of 450kw generator just for load shifts.

ii) A 300A T.P. 415/3/50, 3 wire W.T. shore supply box to provided c/w circuit breaker, phase sequence indications, pilot lamp and connection terminals. Phase reversal switch

iii) Two (2) 60KVA, 50Hz, 415/220V, main step-down transformers Delta-Delta connected. One of they acts as "spare" as per Classification.

iv) Two (2) 20KVA, 50Hz, 415/220V emergency step-down transformers Delta-Delta connected. One of they acts as "spare" as per Classification.

#### b) DC Supply (24V DC)

i) The 24V DC supply is to be obtained from 1 bank of 200AH, 24V DC regulated output transformer /rectifier with the input coming from the main switchboard. A second unit is to be provided as "spare" to meet classification requirements.

ii) Two (2) bank 200AH 24VDC battery mounted in suitable fiberglass watertight enclosure on wheel house top to be provided and operated during the transition period of half an

hour and to be connected automatically to the emergency switchboard on failure of main AC supply.

iii) A 24V DC supply for the radio is to be obtained from 1 bank of 24V, 200AH battery via the radio battery charging panel.

iv) One (1) 40A, 24V DC output static battery charger to be provided.

v) One (1) 80 KW output diesel driven emergency generator to be provided c/w an independent day tank to last 18 hours. Emergency generator to have sufficient capacity to cater for emergency lights, navigation lights, intercom system, navigation aids, fire detection and alarm system and Aldis light for 18 hours.

#### 4 Cables

All cables installed in the vessel are to be tinned copper conductors ethylene propylene rubber (EPR) insulated PVC sheathed, galvanized steel wire braided. Screened cable to be fitted where interference with navigation aids or radios are likely to occur. All cables for vessel's DP system shall be complied with manufacturers recommended cable layout and construction.

#### 5 Installation of Cables

Cables are generally to be supported by perforated galvanized steel cable tray and secured by a cable clips or similar. Where cables pass through weather tight bulkheads or deck, a W.T. type of cable sealing gland or compound is to be fitted.

All metal sheaths and armour of cables shall be electrically continuous and shall be earthed (grounded). Cables and wiring serving essential or emergency power, lighting, internal communications or signals shall, so far as practicable, be routed clear of galley, laundry, machinery spaces of category A and those of high fire risk area.

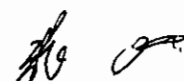
#### 6 Switchboard – General

The switchboard is to be dust, drip-proof and front access type, fabricated of steel sheet with self supporting frame work combined hand rails and ventilation louvers and suitable for marine duties to be installed in the engine room.

##### A) AC Main Switchboard - Auxiliary Service

The AC Switchboard is to consist of the following controls and instrumentation for each alternator;

- 1) Air circuit breaker c/w current, reverse-power & short circuit relays.
- 2) Voltmeter c/w selector switch
- 3) Ammeter c/w selector switch
- 4) Kilowatt meter
- 5) Frequency meter



- 6) Voltage trimmer
- 7) Emergency push switch
- 8) Indicator lights
- 9) Governor switch
- 10) Synchronising system
- 11) Earth test system
- 12) Load shedding system
- 13) Power factor meter

The following outgoing circuits are to be fed from the 415V & 220V bus-bars via plug-in moulded case circuit breaker

- 1) Fuel oil cargo pump
  - 2) Starting air compressors
  - 3) Ballast & drill water pump
  - 4) F.W. cargo pump
  - 5) Drill water cargo pump
  - 6) Air-conditioning plant
  - 7) Ventilation fans
  - 8) Thruster compartments ventilation fan
  - 9) Marine electric range
  - 10) Fuel oil transfer pump
  - 11) Purifiers
  - 12) Cold/cool room plants
  - 13) Bilge & ballast pump
  - 14) Standby pumps(all need for notation ACCU)
  - 15) Dirty oil transfer pump
  - 16) Hydraulic power packs
  - 17) Sewage treatment plant
  - 18) Pressure sets
  - 19) Navigational aids (220V)
  - 20) General lighting and power (220V)
  - 21) Cement compressors
  - 22) Oily bilge water separator
  - 23) Six (6) nos. spare circuit breakers (415V & 220V)
  - 24) Laundry equipment
- B) 24V DC Emergency Switchboard

One (1) emergency switchboard, drip-proof, dead front, self-supporting framework c/w necessary instrumentation, indications and controls necessary for automatic energizing in the event of mains supply failure.

- 1) The instrumentation and controls are to consist of the following;
  - a) Battery charging switch
  - b) Moulded-case circuit breaker
  - c) Ammeter c/w shunts
  - d) Voltmeter
  - e) Indication light
  - f) Battery change-over contactor
  - g) Testing facilities
  - h) Change-over switches battery X 2

The following outgoing circuits to be fed from the bus-bar via moulded-case circuit breakers;

- a) Navigational aids
- b) Emergency lights
- c) Alarm (general, fire, CO2, engines and low levels)
- d) Navigation lights
- e) Main engine & thruster Instrumentation

An indicator to be provided in the AC main switchboard to indicate the transition battery on a discharge condition.

- C) On/off switch panel to install on W/H console with following control.
  - a) Deck light, searchlights, floodlight, wiper. CVS, magnetic compass c/w dimmer.

7. 24V DC Radio Battery Charging Panel

The radio battery charging panel is to consist of the following control and instrumentation;

- 1) Battery charging switch
- 2) Ammeter c/w shunt
- 3) Voltmeter
- 4) Radio load selector switch
- 5) Indication lights
- 6) Control and outgoing fuses

8. Distribution Boards

Sufficient number of distribution panel boards shall be provided and installed for AC and DC distribution services. Distribution panel boards shall be fabricated of sheet steel construction suitable primed and painted for protection against corrosion. All outgoing circuits shall be protected by thermal-magnetic, trip-free type MCBs. Each distribution board shall be furnished with an in filled directory sheet encased in a transparent plastic cover and mounted inside. All distribution boards shall be identified by an engraved plastic name plate.

9. Motors & Starters

Motors are generally to be of squirrel cage type with totally enclosed fan cooled construction. All motor starters to be suitable for marine use and provided with single phasing, overload protection and running indication. Steering gear circuits are to be provided with motor running indicator an audible and visual alarm for phase power failure, control power failure, motor overload and low oil level in wheel house and E.C.R. in accordance to Class requirements. The main steering power unit to start automatically when power is restored after a power failure. Fuel pump, and all engine room supply ventilation fans are to have remote push stop controls mounted in the main deck area adjacent to engine room entrance and clearly marked. A separate stop is to be provided in the wheel house for air-conditioning plant and accommodation fans.

In principal, all motors 15kw and under to be protected by direct-on-line starter. Motors between 15kW and 55kW to have Star-Delta starters, and motors over 55kW to be protected by auto-transformer starters unless otherwise specified by equipment manufacturers. All motor 20kw or above, the space heater is requested.

#### 10. Lighting

All lighting throughout the vessel to be fluorescent - except in the weather deck area. AHU room, store and emergency lights, where incandescent lights are to be adopted. Fluorescent lights in accommodation are to be flush ceiling mounted. All light fitting in engine room and other machinery spaces as well as deck lights are to be W.T. All cabins to be provided with desk and reading lights. 24V DC floodlight fittings to be mounted in way of life raft & rescue boat stations. Compass light and chart light to be provided with dimmer switch.

Five (5) 1000w floodlights, one (2) forward and two (3) aft. Sodium Vapour type

Three (3) 2000w searchlight, one (1) forward and two (2) aft. Electrical remote controlled.

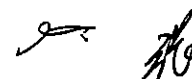
#### 11. Switches, Sockets & Switch Sockets

All switches, sockets and switch-sockets in accommodation are to be plastic cased and in the engine room and other machinery space are to be W.T. and metal moulded. An adequate number of switch sockets to be provided in accommodation, galley, mess room, workshop and other machinery spaces for portable equipment.

#### 12. Navigational Aids

a) The following navigation aids equipment of 220/1/50 AC supply;

- 1) Two (2) 2000w searchlights, with electrical remotely controlled.
- 2) Two (2) radars c/w display, transceiver and scanner unit
- 3) One (1) chart table light c/w dimmer switch
- 4) Three (3) floodlights of 400w sodium vapour type.
- 5) One (1) gyro compass



- 6) One (1) autopilot
- 7) One (1) echo-sounder
- 8) One (1) speed & distance log
- 9) One (1) TV/Radio antenna
- 10) One (1) Weather fax

b) The following equipment of 24V DC supply;

- 1) Two (2) rudder indicators c/w illumination
- 2) One (1) standard magnetic compass c/w illumination
- 3) One (1) daylight signalling lamp
- 4) One (1) intercom/PA system
- 5) Two(2) VHF radios
- 6) One (1) Anemometer
- 7) One (1) AIS
- 8) One (1) GPS
- 9) One (1) MF/HF radio station
- 10)One (1) Navtex
- 11) One (1) Inmarsat-C station
- 12) One (1) NBDP terminal

### 13. Navigation Lights

220V AC supply navigation lights are to be fitted. The navigation lights are to consist of the following;

- 1) Three (3) masthead lights, dual lens type
- 2) One (1) port light, dual lens type
- 3) One (1) starboard light, dual lens type
- 4) One (1) stern light, dual lens type
- 5) One (1) anchor lights, dual lens type
- 6) Two (2) NUC lights, dual lens type (RWR)
- 7) One (1) towing light, dual lens type
- 8) One (1) complete set of immigration lights, single lens type

All navigation lights are to be controlled by indicator panel fitted in the wheel house.

Each navigation light is to be controlled and protected by double pole switch and fused on each conductor. Visual and audible alarm indicator is to be fitted.

### 14. Emergency Lights (24V DC)

24V DC Emergency lights are to be fitted at strategic points in the alleyway, stairways, exists, wheel house, lobby, steering gear compartment, engine room, galley, thruster compartment and stowage position of fireman's outfits. In way of life raft / life raft embarkation area, floodlight is to be provided. Emergency lights are to be automatically energized on failure of normal supply system.

#### 15. Fire & General Alarm

Fire and general alarm supply system is to be taken from 24V DC distribution board.

Alarm bells are to be sited within accommodation in accordance to Class requirements. Break glass Alarm points are to be fitted in wheel house, main deck, thruster compartments, forecastle deck and engine room. An alarm horn and revolving red light are to be installed in the engine room and an alarm horn only fitted in the steering gear compartment. An engineer alarm system to be provided in chief engineer's cabin.

A fire detection system based on the self-monitoring principle including periodical testing facilities shall be installed in the machinery spaces and accommodations. It shall be fed automatically from an emergency source of power by or separate feeder if the main source of power fail.

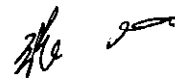
#### 16. Main & Auxiliary Engine Instrumentation & Alarm

The main engine and auxiliary engine instrumentation are to be operated on 24V DC supply. Main engines are to be provided with an emergency stop in the wheel house. Clutch control indication panel to be provided in engine room and forward and aft wheel house control. Main engine and low level alarms should be provided with a panel in the engine room, wheel house and chief engineer's cabin (common fault alarm only) with visual and audible indicators as required by regulations such as low oil pressure, high water temperature, starting low air pressure, tank low level, bilge high level etc. It shall be indicate at the same time more than one fault and the acceptance of any alarm shall not hinder another alarm. Alarms shall be maintained until they are accepted and the vessel indicators shall remain until the fault has been corrected.

The 24V DC supply to automatically change over to a standby power supply in case of loss of normal power supply and failure of the normal power supply shall be alarmed.

## SECTION 10 - SPARES & TOOLS

- 1) Lifting lugs suitable for the use of chain block are to be fitted in the following positions;
  - a) Two points above each end of each main engines. Trolley beam + pulley
  - b) One point above each gearbox.
  - c) Two points above each diesel engine - one point above each alternator.
  - d) One point above bow thruster motor.
  - e) Two points on the outside of the hull and adjacent to each rudder propeller.
- 2) One (1) workbench with drawers under in the engine room
- 3) One (1) 6" vice mounted to the workbench.
- 4) One (1) bench girder.
- 5) One (1) steel locker with padlock for spares.
- 6) Pedestal drill 15mm.
- 7) 400amp welding transformer.





## SECTION 11- EXTERNAL FIRE FIGHTING

External fire fighting system is to be as generally stated below and is required to meet FIFI Class 1.

### 1) Fire pumps

Two (2) seawater pumps each 1500 m<sup>3</sup>/hr at 14 Bar. The pumps to be driven from the front PTO of the main engines via gearbox (increaser) with built-in clutch.

Independent sea suction and piping system for each pump. The pump casing to be cast steel, shaft acid proof steel & impeller of Al-Bronze.

Capacity	:	1500 m <sup>3</sup> /hr
Head	:	140 MLC
Pump speed	:	1800 Rpm
Power absorbed	:	Maker requirement
Driver power	:	Maker requirement

### 2) Fire Monitors (water/foam)

Two (2) units water monitors (one with double barrel for foam discharge). Electrical joystick control from the wheelhouse.

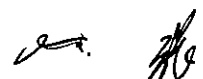
Two (2) hand wheels for emergency manual control also built on the monitors.

Capacity	:	1200 m <sup>3</sup> /hr
Inlet pressure	:	12 bar Throw
length	:	120m
Reaction thrust	:	16.58 KN
Swivels and swivel	:	Bronze
Barrel	:	Acid proof steel, according to requirement for FF Class I vessel.
Throw height	:	45m measured vertically from sea level assuming a mean impact area located at a horizontal distance not less than 70 m from nearest part of vessel. Horizontal and vertical movement with limit stops restricting monitor discharge on any part of the vessel.

### 3) Monitor control

The monitor remote control system consisting of the following:

- One (1) main control panel – logic for operation of monitors.
- One (1) joystick panel for installation in wheelhouse with the following remote functions
  - i) elevation and rotation of monitors.
  - ii) clutch in/out operation of fire pumps.



4) Deck Delivery Heads

Two (2) sets of 4-way 65mm delivery heads with instantaneous hose connections are to be fitted on main deck.

5) Fixed Water-Spraying System

The vessel is to be protected by a permanently installed water-spraying system consisting of a number nozzles fitted on all deck levels. The fixed water spraying system is to provide protection for all outside vertical areas of hull, superstructures and deck houses including foundations for water monitors and other equipment. The arrangement for the water-spraying system is to be such that necessary visibility from wheel house and the control station for remote control of the fire fighting water monitors can be maintained during the water spraying.

The pipelines and nozzles are to be so arranged and protected that they will not be exposed to damage during the operations. The fixed water spraying system is to have a capacity not less than 10 litres/min/m<sup>2</sup> of the area to be protected.

6) Sea Chest

Two (2) independent sea chest for external fire fighting is to be fitted.

7) Foam/Dispersant System (comply to FiFi Class 1 Requirement)

Foam system to come with tank of 20m<sup>3</sup> capacity and foam monitor. Dispersant system to come with tank of 20m<sup>3</sup> capacity with 6m length spray boom on each side of vessel. Dispersant system to have proportional and metering devices.

8) Search Lights

Three (3) searchlights are to be provided to comply with Classification requirements for operations at night.

There are to be capable of providing an effective horizontal and vertical range of coverage to illuminate up to a distance of 250m in clear air at minimum level of 50Lux within an area not less than 11m diameter.

The controls shall be placed within ergonomically reach of the navigating officer at both fwd and aft control consoles.

**SECTION 12– DYNAMIC POSITIONING SYSTEM (DPS-2)**

1 Dynamic position system

The D.P system shall enable the vessel to offshore/ perform safe and efficient operation and system shall comply with the requirement for DP-2. According to Classification DPS-2 and details of information/ system shall be as per Maker’s recommendation but to be in accordance to the Class rules as applicable.

Maker: Kongsberg

Basic requirement not limited to the following:-

System	Component	ABS (DPS-2)
Power System	Generators and Prime Movers	Redundant
	Main Switchboard	1 with bus-tie
	Bus Tie Breaker	1
	Distribution Systems	Redundant
	Power Management	Yes
Thrusters	Arrangement	Redundant
Control	Manual Control – Single lever for each thruster	Yes
	Independent Joystick – Combined Joystick	Yes
	DP Control computer(s)	2
Sensors	Position Reference	2 x DGPS 1 x Laser Reference system
	Wind	2
	Gyro	2
	Vertical Reference Unit	2
UPS		2
Alternate Control Station for backup unit		No
Printer for alarm data log		2
FMEA		Yes

- Remarks: 1) The failure mode & effects analysis (FMEA) shall be completed and submitted to classification for approval and to the satisfaction of the Owner.
- 2) All the supporting operation system and in operation equipment must be designed/ arranged and to meet/ comply with classification DPS-2 requirement (latest rules as applicable)
- 3) Provision for hydro-acoustic positioning system interface to be outfitted.

The table of system arrangement as shown above is provided herewith for the Builder to refer.

**EQUIPMENT LIST FOR 75M PLATFORM SUPPLY**  
**VESSEL (2 × 3000BHP)**

Owner: Yard No. DN75M-13/15				Dated : 15 Oct 2012 Updated : Rev :		
Item	Description	Qty	Country	Specifications	Brand	Remark
<b>A</b>	<b>Machinery &amp; Equipment</b>					
1	Main engines 主机	2	Japan	8L28HX3000HP@750RPM	Niigata	
2	Rudder Propeller 舵桨系统	shipset	Japan		Niigata	
3	bow thruster 艏侧推	2	China	Abt. 10t controllable pitch	Kawasaki	Wuhan
4	Shaft Generators 轴带发电机	2		2 x 1000 KW	Leroy Somer /Siemens	
5	Generating sets 发电机组	3	USA	450 kW 50 Hz 415V	Cummins/Cat/ Volvo penda	Cat
6	Emergency generator 应急发电机	1	USA / UK	80kW 50 Hz 415V	Cummins/Cat/ Volvo penda	
7	Starting air compressors and reservoir 启动空压机装置	2	Norway	22m <sup>3</sup> /hr x 30 bar	Sperre/Atlas/ NK	Reservoir supplied by Niigata
8	Anchor windlass 锚机	1	Singapore	13 tonnes at 18m/min for 46 mm chain	Plimsoll/ Mentrade	
9	Tugger winches 系缆绞车	2	Singapore	10 tonnes at 24m/min	Plimsoll/ Mentrade	
10	Capstans 绞盘	2	Singapore	10 tonnes at 25m/min	Plimsoll/ Mentrade	
11	Deck crane 甲板吊机	1	China	3t SWL 10m	Taixin	
12	Pumps 泵浦	shipset	Spain		Azcue / Itur Myer/Desmi	
13	Mud Agitator 泥浆搅拌器	6			Pilvad/ITT	Electric pump
14	Bulk handling system 水泥罐系统	2	Japan	80 psi pressure	Unislip	
15	Bulk air compressors 水泥罐压缩机	2	Japan	20.0m <sup>3</sup> /min at 80 psi	Unislip	
16	L.O. purifier 滑油分油机	1	Int'l	w/ heater	MKK/Alfa Laval/Wesfalie	
17	F.O. purifier 燃油分油机	1	Int'l		MKK/Alfa Laval/Wesfalie	
18	Sewage treatment plant 污水处理装置	1	China	For 50 persons	Taixing/CK	Remote alarm reading in ECR
19	Oily water separator 油水分离器	1	Germany	1.0 m <sup>3</sup> /hr x 2 kg/cm <sup>2</sup>	Ocean clean	Remote alarm reading in ECR
20	External fire fighting 对外消防	2	Norway	Fi-Fi 1	FFS / Jason	
21	BA compressor 呼吸器充气机	1	UK			

22	Cargo F.O. flowmeter 货油流量计	1	Japan	150 m <sup>3</sup> /hr	Nitto Seiko	Remote alarm reading in WH
23	Cargo F.W. flowmeter 货水流量计	1	Japan	100 m <sup>3</sup> /hr	Nitto Seiko	Remote alarm reading in WH
24	Fire detection system 火灾探测报警系统	1	Sweden/UK		Consilium/ Tyco	
25	Dispersant system 分散油剂系统	2	Singapore		Unitor	
26	Wipers 雨刮	3	Korea	Pantograph	Chungsol/wyn	c/w water spray Pendulum type
27	Clear View Screen 旋转视窗	2	China	350mm		
28	Air horn 气笛	1	Germany		ZOELLNER	
29	Mechanical fog horn 雾笛	1	Germany		ZOELLNER	
30	Washing machines 洗衣机	3	USA	10 kg	Sears / KOREA	
31	Dryers 干衣机	3	USA	10 kg	Sears / KOREA	
32	Electric cooking range 电灶	2	Korea	4 hot plates		
33	Helmsman chairs 舵手椅	3	China			2 sliding 1 fixed
34	Water maker 制淡水机	2	USA	10t/day	Sea recovery	c/w sand filters and flush back system
35	Valves 阀件	Shipset	China			
<b>B</b>	<b>Electrical</b>					
1	Main and emergency switchboards 主应急配电板	shipset	Singapore		EMS	
2	Engine telegraph 机舱传令钟	shipset	China			
3	Lights 灯	shipset	China			
4	Battery chargers 充电机	shipset	USA		Victron energy	ER, WH, ECR
5	Navigation lights 航行灯	1 set	Germany		Aqua Signal/ Wiska	
6	Search lights 搜索灯	3	Germany	electric joystick control	Aqua Signal/ Wiska	Specification mentioned Remote control
7	Flood lights 泛光灯	5	Germany	1000W	Aqua Signal/ Wiska	
<b>C</b>	<b>Accommodation</b>					
1	Refrigerator 电冰箱	1	China	530litre	Hair	Galley
2	Refrigerator 电冰箱	2	China	206 litre	Hair	One each in mess and recreation
3	F.W. electric heater	1	China	300 litre	Taixing	

	淡水电热柜					
4	Hot water circ pump 热水循环泵	1	Spain		Azcue / Itur Myer/Desmi	
5	Electric Blender 电动搅拌机	shipset	China	50HZ 220V	Guangleng	
6	DVD Player DVD 播放器	3	China	50HZ 220V		
7	21/29" MultiSystem TV 21/29" 电视机	shipset	China	50HZ 220V	LG/Hair	
<b>D</b>	<b>LSA / Firefighting Equipment</b>					
1	Inflatable liferafts 救生筏	6	China	25-man		
2	Medical Breathing apparatus 医用呼吸器	1	China			
3	Fireman's outfits 消防员服	shipset	China			
4	(EEBD)应急逃生呼吸器	9	China			As per regulations
5	Water mist system 机舱水雾		Singapore		Safetec	As per regulations
6	Fix CO2 system 固定式 CO2		Singapore/ China		Safetec/Jiangxi	
7	Immersion suits 保温服	56	China		Rongde	
<b>E</b>	<b>Air Conditioning and Refrigeration Systems</b>					
1	Air con system 空调系统	shipset	Singapore	Bock/Carrier compressor	JL	
2	Refrigeration system 冷藏系统	shipset	Singapore	Bock/Carrier compressor	JL	
3	ECR packaged air con 机舱监控室空调	1	Singapore	Ceiling mounting	JL	
4	Air con sea water pump 空调海水泵	1	Spain		Azcue /Desmi	
5	Refrigeration sea water pump 冷藏海水泵	1	Spain		Azcue /Desmi	
6	Cold room insolation 冷藏库绝缘板	shipset	China			
<b>F</b>	<b>Navigation Equipment</b>					
1	GMDSS Area A1+A2+A3 无线电通讯组合电台	shipset	Japan	RC-1800T	Furuno	
2	Radars 雷达	1	Japan	FAR-2117 X Band With ARPA 96NM	Furuno	20"
3	Radars 雷达	1	Japan	FAR-2137 S Band With ARPA	Furuno	20"
4	GPS 卫星定位仪	1	Japan	GP-150	Furuno	
5	Echo sounder	1	Japan	FE-700	Furuno	

	测深仪					
6	Navtex 航行警告接收机	1	Japan	NX-700B	Furuno	
7	Weather Facsimile 气象传真机	1	Japan		Furuno	
8	Auto-pilot 自动操舵仪	1	German	BST:1975	Anschutz	
9	Gyro-compass 电罗径	3	German	BST:2217	Anschutz	Inclusive of DP sets
10	Inmarsat-C 卫星 C 站	1	Japan	Felcom-15	Furuno	
11	Speed log 测速仪	1	Japan	DS-80	Furuno	
12	Magnetic compass 磁罗径	1	UK	SCH105	Lilley&Gillie	
13	SART 雷达应答器	2	UK	RT9	McMurdo	
14	EPIRB 应急示位标	1	UK	E5	McMurdo	
15	AIS 自动识别系统	1	Japan	FA-100	Furuno	
16	Portable GMDSS VHF 对讲机	3	UK	R2	McMurdo	
17	Anemometer 风速计	3	UK	ST-60+	Raymarine	Supply By DP
18	Sound power telephone 声力电话	shipset	Norway	VSP	PhonTech / Vingtor	
19	P.A. & intercom systems 广播对讲系统	shipset	Norway	SPA-400-V2	PhonTech / Vingtor	
20	Auto telephone system 自动电话交换机	shipset	Norway	ACM-M-D	PhonTech / Vingtor	
21	Dynamic position system DP2 动力定位	shipset	Norway/ Holland/ USA		Kongsberg/ Navis/MT	Kongsberg
22	Ardis lamp 白昼信号灯	1				Rules requirement
23	BNWAS 驾驶室值守系统	1	Israel/ Japan		Totemplus	