

CONTRACT SPECIFICATION FOR
(Specification No. SS/2006/MOE/01 Rev. C dt: 11-05-2006)

CONSTRUCTION OF 2 NOS.

WORK BOAT-CUM-SUPPLY
VESSELS

FOR

MARWA OFFSHORE ENTERPRISES (MAURITIUS)
PRIVATE LIMITED
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MAURITIUS
BY

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Chapter I
OVERVIEW

1. General :

This contract specification no. **SS/2006/MOE/01 Rev.C** and General Arrangement Plan No. **SS/TD-20/MOE/Rev B**, both dated :11.05.2006 describes series of 2 nos. workboat-cum-supply vessel/s is to be built for the seagoing operations as appended hereto.

Materials, Machinery and Equipments are to be of recognized manufacturers and to satisfy the requirement of rules and regulations of American Bureau of Shipping and of flag state administration and be able to fulfill the general demand of offshore industry for which it is to be designed.

If any discrepancy is found between the Contract and the Specification, the Contract shall prevail, and if any discrepancy is found between the Specifications and the accompanying Plans, the Specifications are to be taken as finally binding.

Any item, which is not expressly called for in the Specifications, shall not be furnished by the Builder.

The vessel is to be designed in such a way that it can perform roles of : (i) movement of men and materials from Shore to offshore platform or between the offshore platforms, (ii) capable of 24 hours operation a day attending to offshore platform repairs continuously for 30 days, (iii) auxiliary duty to include part replenishment of fuel oil, fresh water to platform requirements. The vessel/s shall be locally strengthened for the scope for future fitment of fitting an 'A' frame structure astern, 4 - point mooring system and towing winch (these fittings are not part of present contract). Builder shall supply and fit SORMEC Make Marine deck crane Model M45 FB/4S with foldable boom or equivalent make, type and capacity crane as required by owners. The deck shall be strengthened to fit owner supplied crane.

2. **Description** :

The vessel is to be a round bilge hull, a single decker with superstructure / deckhouse arrangement forward. The machinery are to be arranged under-deck aft and mid-ship region whereas the accommodation spaces are to be arranged mostly above-deck forward. The vessel is to be fitted with two controllable pitch propellers and powered by two marine diesel engines and two electric motor driven bow thrusters at forward.

Two built-in passive stabilizing tanks are to be arranged below the main deck. The ship is to be arranged with accommodation for 25 officers and crew including catering staff. In addition, 49 special persons are to be accommodated.

The term supernumerary as mentioned in this specification may be substituted by 'Special personnel', subject to that the same do not attract any additional technical requirements.

3. **Main Particulars (Preliminary)** :

Length overall	approx 63.00 m
Length b.p.	approx 58.91 m
Breadth moulded	approx. 14.60 m
Depth moulded	approx. 5.50 m
Draught max.	approx. 4.00 m
Cargo deck, free area	min. 350 m ²
Dead weight (d = 4.0 m)	approx 1200 Tonnes
Gross Tonnage	approx 1750
Service speed (85 % MCR)	approx 12 knots
Endurance	30 days full steam

The measurements, calculations etc. are to be in accordance with metric or decimal system and the units are to be in SI system.

4. Class, Statute, Certification :

Vessel is to be built of steel and to American Bureau of Shipping class notations **Maltese cross A1 Circle (E) Maltese cross AMS, Work boat-cum- Supply Vessel unrestricted service** according to their latest rules and regulations for all-weather sea going operations. The vessel is also to satisfy the rules & regulations of Flag administration which is to be Mauritius.

The vessel is to satisfy the applicable regulations including amendments to SOLAS '74/88, MARPOL '73/78, International Loadline Convention '66, Rules concerning International Tonnage Convention '69 and all other applicable International & Flag State rules for worldwide operations as prevailing on the date of signing contract.

In order to fulfill these requirements the following international regulations and recommendations are to be applied:-

- (a) The International Convention on Load Lines, 1966 (Type 'B' Freeboard)
- (b) Rules of the American Bureau of Shipping
- (c) The International Regulation for Tonnage Measurement of Ships, 1969
- (d) The International Convention for the Safety of Life at Sea (SOLAS), 1974/88 for Cargo Ships, including all amendments
- (e) The International Convention for Prevention of Pollution from Ships, 1973/78 and Protocol 1978, MARPOL 73/78 including requirements of the Baltic Sea Convention
- (f) Radio Communication Regulation to International Regulations
- (g) The International Convention for Prevention of Collision at Sea, 1972 with amendment.
- (h) IMO Code on noise and vibration onboard of sea-going Vessels
- (i) Requirements for Accommodating of Crew on Board of Ship ILO 133, 1970, 152, 140, 141 (as applicable)

- (j) Wireless Safety Requirements (GMDSS)
- (k) Maritime Laws and Regulations of the Flag State Authorities
- (l) IMO Resolution A469 for Intact Stability
- (m) IEC Regulation relating to Vessel/s electrical equipment system.
- (n) IMO Resolution A. 534 (13)

Original certificates are to be provided from ABS, manufacturers, flag state administration (Mauritius) as per rules, regulations and/or requirements and accompanied by survey report where relevant.

5. Drawings, Instruction Manuals etc. :

Important arrangement and class drawings are to be submitted to the owner in duplicate for their concurrence before they are used for construction. Drawings not returned by the owners within two weeks after receipt at their end would be treated as tacit acceptance of builder's proposal.

One original and two certified copy each of all approved drawings (by relevant authorities) are to be delivered by the builder as per normal ship building practice. In addition two sets of as-fitted drawings (list to have prior approval of the owners) relevant for future operation & maintenance of the vessel are to be also provided. CD Containing all drawings are also to be supplied to the owners.

An approved set of drawings including fire control plan, LSA Plan, L&SS Plan, Damage Control Plan, GA Plan and Capacity Plan are to be framed and mounted on-board.

The operation and maintenance manuals received from the manufacturers of all major machinery and equipments are to be passed over to the owners at the time of delivery. The builder is to prepare a "component list" with brief description of all equipment and with a statement of Make, Type, Production no., supplier with address, Telephone no., Facsimile no. and other relevant information for effective maintenance of the vessel.

6. Certificates :

Following Certificates and Classification Reports are to be delivered.

i) Certificates to be issued by American Bureau of Shipping :

- a) Classification Certificates of Hull and Machinery
- b) Certificate for Anchor, Chain Cables and Windlass.
- c) Other Certificates of Machinery / Equipment if issued by ABS.

ii) Certificates to be issued by Flag State Administration / ABS

- a) International Loadline Certificate
- b) Cargo Ship Safety Construction Certificate
- c) Cargo Ship Safety Equipment Certificate
- d) Cargo Ship Safety Radio (GMDSS) Certificate
- e) IOPP Certificate
- f) IAPP Certificate
- g) Letter of Compliance for Carriage of Dangerous Packaged Goods on Deck. (if owner so specifies prior to delivery)
- h) Any other statutory Certificate which may come into force and become obligatory for the vessel under construction to meet.
- i) Radio station Certificate
- j) Certificate of Registry.
- k) ISPS Certificate.
- l) International Tonnage Certificate with tonnage computation details
- m) Minimum Safe Manning Certificate.
- n) Continuous Synopsis Record.

For any Statutory Certificate the builder shall provide all necessary documentation and all opportunity for necessary tests, trials and inspection by concern authority at builder's yard. However all necessary liaison with flag state administration as well as other statutory authorities shall be responsibility of owners at their cost including payment of fees. Builder shall be however responsible for payment of fees to classification society.

iii) **Miscellaneous Certificates :**

- a) Builder's Certificate
- b) International Tonnage Certificate 1969
- c) Certificates for Rescue Boat and Life Rafts
- d) Certificates for Compass Adjustment
- e) Certificates for Navigation Lights
- f) Tank Calibration Certificates
- g) Certificate for Rescue Boat Davit
- h) Certificates for Cargo Gear

iv) **Approved Plans from Flag State**

- a) Trim and Stability Certificate
- b) Cargo Securing Manual
- c) Damage Stability Booklet
- d) Sopep Manual
- e) Ship Security Assessment
- f) Ship Security Plan
- g) Tank Calibration Table

7. **Materials & Workmanship :**

All steel materials to be used for building the vessel are to be of ship-building grades approved or recognized by American Bureau of Shipping

All steel castings and forgings used for major components of Hull structure / parts of machinery are to have approval of ABS or of organization recognized by ABS. All non-ferrous materials used for hull skin-fittings or major parts of machinery / equipments / piping system are to be of American Bureau of Shipping approval / type approval. All fiberglass, wooden and other non-metallic items to be used on-board vessel are to have approval of Owners / ABS / flag state as the case may be.

The vessel is to be built, installed with machinery / equipment, fitted out in all respect as per standard ship-building practice. All workmanship are to meet

approval of ABS / Owners and to high quality in line with modern ship-building norms.

8. Purchase / Subcontract Procedures :

Selection of all major machinery and equipments which are specified in the contract specification are to be selected from finalised makers list. Credentials of major sub-contractors to be associated with construction of hull, installation of major machinery and equipments, mechanical / hydraulic / pneumatic / control / electrical / electronics / software related systems are to be communicated to ABS / Owners.

If any machinery / equipment listed in this specification loses its relevance, the same shall be substituted by newer generation equipment or equipment of another manufacturers subject to prior concurrence of the Owners with respect to its price and time implications and approved by ABS.

9. Spare Parts :

The vessel is to be delivered with manufacturers' recommended standard spare parts and ABS regulation spare parts for unrestricted service. The special tools adequate for overhauling as supplied by the Makers are to be also supplied.

List of spares and tools to be provided for owner review. Entire set of tools for overhauling of engine shall be supplied by the builder.

10 Risk & Insurance :

Till the vessel is delivered, the builders is to arrange and pay premium for building insurance of the vessel and procurement thereof in form of materials and equipments. The details of cover is to be worked out with the owners in due course. The insurance is to cover during the final stages of construction to the limit of contract price. The risk of accidental destruction due to fire, flood, earthquake is to be part of the insurance cover.

11. Sea-Worthiness :

The vessel at the point of her delivery is to be provided with all applicable certifications of relevant authorities justifying that she is seaworthy for worldwide operation. The vessel when nearing completion at the builder is to undergo an inclining experiment, as required by the authorities, for assessment of light ship criteria followed by stability calculation for ascertaining her complying with stipulated intact and damage stability requirements in all statutory as well as specified loading conditions if the owner required.

12. Tests & Trials :

During the construction of the vessel at the builders yard, the hull construction is to undergo requisite wet and dry surveys as per requirement of ABS. all the major machineries & equipments are to undergo test bed trials and approval of ABS / Flag Administration as the case may be. After installation of machinery and systems, various machinery system are to undergo dock trials. The vessel after fully fitted out is to undergo sea trials to the requirements of ABS / Owners. Manoeuvring data-sheet is to be provided for use of bridge personnel.

13. Alterations during Construction :

The Owners are at liberty to make alterations in the specification and drawings either before or during the construction of the vessel. In such cases the builder is expected to calculate effect of costs, delivery time and convey the Owners. Any alterations at such time is to be always agreed upon in writing before the work starts.

This specification is regarded to cover complete execution and delivery. Machineries, equipment, hull details etc. specified in several places are to be delivered only once.

Any minor equipment / fittings / hardware that the Owners like to add at the point of her delivery from the builder, the same is to be attended provided such

additions are directly related to operation of the vessel and not likely to affect the vessel's seaworthiness and subject to approval of cost implication, if any.

14. Delivery :

The vessel(s) is to be delivered at the builder's jetty after completion of sea trials and final acceptance by the owners as per contractual delivery period(s).

Failure of the owners to take over the vessel after receipt of 15 days' notice, the builders is entitled compensation on opportunity costs for the vessel occupying the builders jetty and availing associated logistic supports from the builders facility.

Chapter II

BUILDING PROCEDURES

1. Working Procedure :

The Builder is to submit the principal design schedule and construction schedule to the Owner prior to commencement of construction and these schedules are to be kept up in co-operation between the Owner and the Builder.

2. Ship's Plans :

“The Plans” stated hereunder in the Specification shall mean those which are to be submitted to the Owner, such as the Contract Plans, plans for approval, finished plans, instruction booklets, etc. All plans and other documents which are to be submitted to the Owner, are to be written in English Language.

The plans including the “as fitted” plans are to be made in suitable scale and to be consistent according to the Builder’s usual practice, and are to be in black line copy as a rule.

3. Plan for Approval

Prior to starting work, the Builder is to submit the soft and hard copies of the specified arrangements plans to the Owner, the plans required as per relevant rules are to be submitted to the regulatory bodies for approval in due time of design and construction schedules.

Complete list of class & statutory drawings to be submitted by builder to owners for review.

The list of the arrangement plans for approval of owners is to be mutually agreed between the Owner and the Builder.

The list of plans to be submitted to ABS for their approval generally are as hereunder :-

1. General construction drawing (transverse frame sections)
2. Construction of the oil tight and watertight bulkheads and tanks
3. Construction of the main deck and above with girders and pillars
4. Construction of the forecastle deck with girders and pillars
5. Construction of ship ends with stem, stern and appendices
6. Construction of the deckhouse, wheelhouse, casings and funnels
7. Construction of the foundations of the diesel propulsion engine and auxiliaries in the machinery space
8. Construction of hawse pipes and chain lockers
9. Construction of the foundation of winches, gantries and deck auxiliaries
10. Construction of hatches, trunks, skylights, etc.
11. Construction of bulwark, railings, stairs, ladders, etc.
12. General arrangement plan of the engine room and bow thruster room, layout of engine room and bow thruster room floor and gratings
13. Diagrams of all piping systems (ballast, engine, etc.)
14. Diagrams and construction details of the propulsion, installations, remote control, etc.
15. Diagrams and building details of the pneumatic and hydraulic installations
16. The construction drawings of the controllable pitch propeller unit (if applicable)
17. Arrangement of deck auxiliaries, hoisting gear
18. General arrangement of deck crane, construction of masts and rigging
19. Plans with details of the paneling, linings, ceilings, floor covering and arrangements of the accommodations, stores, bridge, etc.
20. Plans with details of natural ventilation
21. Drawings with details of the air conditioning and the mechanical ventilation systems

22. Arrangement of rescue boats and davits
23. Arrangement of gangway and platforms and accommodation ladder
24. Body plan with appendices
25. Hydrostatic and cross curve diagrams and calculations
26. Tank capacities with centers of gravity
27. Strength calculation
28. Tank testing plan
29. Docking Plan
30. Safety and fire-fighting plan
31. Single wiring electric diagram
32. Electrical load analysis (24 Volts DC, 415 Volts AC, 220 Volts AC)
33. Heat and cold balance (air conditioning, cold storage room)
34. Builder's standard (welding frames, manholes, portholes)
35. Emergency generator and electrical switchboard
36. Main switchboard
37. Short-circuit calculations
38. Piping insulation
39. Vent pipes filling and sounding pipe
40. Fire detection cabinet, location of heads and CO₂ piping schematic diagram of alarm devices, safety circuits, remote-control
41. Circuit breaker (justification of choice)
42. Navigation instruments (radar, radio positioning system, Echo Sounder, etc.)
43. Cathodic protection (zinc anode location)
44. Paint specification, etc.
45. Domestic & sanitary water piping
46. Strengthening of for 4 point mooring bridge layout plan
47. Bridge layout plan
48. Damaged stability
49. Cargo securing manual
50. Garbage management plan
51. Ballast management plan
52. Structural fire protection plan
53. Load line plan

The designer is to amend/incorporate the Owner's and Builder's comments into the drawings, if so required, before submitting to ABS for approval.

The Owner's Representative is to have access to verifying any of the plans with the builder at any point of construction, in addition to the list of plans agreed upon.

The Builder's standard plans and the sub-contractor's or the manufacturer's plans is to be used as working plans or plans for approval.

4. As Fitted Drawing

At the time of delivery of the Vessel, the Builder is to furnish to the Owner with three (3) copies of each "as fitted" plan and two (2) copies of each original instruction booklets of the manufacturer of all machinery & equipments.

The lists of as-fitted plans are to be mutually agreed upon between the Owner and the Builder.

5. Manual / Booklets :

Two (2) sets of all manufacturer's instruction manuals and maintenance books, service manuals, spare parts lists and lists of agents are to be supplied to the Owner.

All such documents are to be in English Language, indexed and placed in substantial box files.

6. Supervision :

The Vessel is to be constructed and equipped in accordance to this specification and under the supervision of the ABS's Surveyor in compliance with the Builder's Construction Schedule.

Throughout the construction period and prior to delivery, the Owner's Representative is to have free access to all premises of the builder or its sub-contractor's where the Vessel or parts of it are being manufactured during normal working hours.

On the construction of the Vessel, the Owner's Representative is authorized to intervene in the detailed matters directly with the accredited representative of the Builder, if there are major deviations from contract specification. An office space for owner supervisor/s shall be provided by the builders during construction period of the vessel/s at no cost to the owners.

Builder is to always ensure and maintain cleanliness and safety on-board throughout the construction period, Spill oil is to be removed promptly. Garbage is to be removed promptly. Smoking is not be permitted on-board. Lighted access is to be provided throughout construction area.

In case the opinions differ during supervision between the Owner's Representative and the Builder's QA Inspector, they are to confer together with the ABS Surveyor and the designer, as appropriate.

7. Delivery :

When the Vessel is completed and is ready for service, having passed the tests & trials and is certified as prescribed in the Specification, the Vessel is to be delivered to the Owner as per Contract.

8. Builder's Responsibility :

Builder is responsible for the liaison between sub-contractors of equipment requiring inter-linking to ensure proper interfacing and compatibility of equipment.

Builder is solely responsible for the construction and quality of work for the vessel. The fact that drawings and data are shown to the Owners or approved by the Owners

or their Representative, does not relieve the Builder in any way from the above mentioned responsibility.

During the building and fitting out of the Vessel, Builder is 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 is to be taken to protect equipment from dampness, dust ingress, weld spatter, paint and general mechanical damage to Owner's approval. Any damage is to be made good to Owner's satisfaction, at Builder's expense.

Chapter III

HULL – CONSTRUCTION & MATERIALS

1. Shot blasting, shop priming, cleaning of materials. :

All steel materials used for building the vessel are to be shot blasted and cleaned before applying shop primers. Prior to applying each coat of paint, all surfaces are to be thoroughly cleaned and made free from scale, grease, moisture or any other foreign matter. Special coatings wherever applied such as floor coverings, tiling, insulation etc., preparation and priming of steel material in way are to be carried out as per standard ship-building practice

2. Welding, testing of Hull parts :

The hull and superstructure are to be all welded construction. A welding schedule for the entire steel structure including sequence of welding are to have prior approval of ABS. The skilled welders are to go through or hold approval certificates from ABS / other organizationals recognized ABS for undertaking construction of hull and superstructure. Gama-ray or ultra sonic test of welding connections as appropriate are to be carried out at positions identified by attending ABS surveyor / quality assurance department of the builder as per good shipbuilding practice.

All tanks are to be hydro / air tested according to the requirement of ABS. All decks, shell plates, bulkheads are to be hose-tested or as required by ABS.

No tank or compartment boundary connection is to be coated or painted until testing is completed and passed by competent authority.

3. Hull Structural Arrangement :

The construction of hull is to be undertaken in the building berth / slipway by assembling of structural blocks of maximum size the builders is capable of handling. Details of such blocks and their sequence of assembly are to be done with prior acceptance by attending surveyor(s) from ABS. The builder is to ensure that the

scantlings of all structural parts including their end connections are undertaken in accordance with ABS approved structural plans.

The steel hull is to be built with combination of transverse and longitudinal frame system. The superstructure is also to be made of steel construction.

4. Keel

A flat plate keel of required thickness is to be fitted, connected throughout the length to the centre girder. It is to be tapered at the forward and aft end.

5. Bilge Keel

Bilge keel made of 450mm x 16mm plate with 30mm dia., round bar and doubler are to be provided at amidships for not less than 1/3 the length of the Vessel on both sides at round of bilge.

6. Aft Body

The after body is to get a well-stiffened transom end. Floor plates are to be arranged at every frame with lightening holes for sufficient access to all spaces. Non-watertight Swash bulkheads with lightening and access are to be provided as necessary.

7. Machinery Rooms

Foundation of main engines are to have ample strengthening and good connection to the Vessel's hull. Foundations of main engines are to be forming a part of the bottom construction in way of the main machinery room. Foundations for main diesel generator units, pumps, separators, deck machinery etc. are to be provided with sufficient strength in order to suppress vibrations during their operations.

8. Floor and Bottom Construction

The Vessel is to be designed to have double bottom structure except for forepeak & aft peak spaces. Tanks for fuel oil, fresh water, dirty oil, sludge, oil, sewage, water ballast, etc. are to be arranged as appropriate. Inner floors and longitudinal girders of bottom construction with sufficient lightening holes (also for good access), limber and air holes are to be provided except where watertight or oil tight construction is required.

9. Shell Plating, Frame, Bulwark, etc.

Bottom and side shell plating, including bilge radius and frames, are to be in accordance with ABS Regulations. In way of hawse pipes, propeller area, shafts, thruster units and sea chest plating and openings, the plate thickness are to be increased as required by rules.

10. Deck Plating

Exposed main deck plating aft part of the vessel is to be additionally strengthened for deck loading of **7.5 tonnes / m²**

Plating of decks are to be according to ABS Regulations and locally strengthened wherever necessary in way of windlass, crane pedestals winches, mooring bitts, etc.

11. Bulkheads

Watertight transverse and longitudinal bulkheads are to be arranged for construction of hull. All bulkheads are to be fitted according to ABS Rules.

12. Forward Body

The fore body is to have raked stem above load water line and is to be built of steel plates and sections as per ABS rules. The fore body including lower part of stem is to be well stiffened for resisting damage in soft grounding.

Swash bulkheads with lightening holes are to be provided in part of the fore peak on the center line. Chain lockers in fore body are to be provided into two compartments by a thick (16mm) non-watertight bulkheads on the center line with cut-in-steps.

Loose gratings of perforated steel plates of 25mm thick are to be arranged inside of the chain lockers and to have a minimum height of 600mm above the bottom of the chain locker for good drainage. The chain lockers are to be arranged with bilge pipe and piping arrangement.

13. **Superstructure Arrangement** :

A four-tier superstructure as per GA Plan is to be erected at the forward part of the hull. All decks of superstructure including main deck are to have no sheer or camber and deck height in way of accommodation spaces is to be 2400 mm from steel plate to steel plate. The deck height in way of Bridge (4th tier) is however to be 2700 mm from steel deck to steel deck. The whole structure is to be of welded construction with embedded to main deck plating.

Exhaust pipe casings / funnel uptake are to be arranged in accordance with General Arrangement drawings. External doors are to be made of steel. All closing appliances including directly mounted on main deck (freeboard deck) are to meet requirements in accordance with International Loadline Convention / ABS Rules.

14. **Bulwark**

Bulwark, reinforced in way of mooring pipes, are to be fitted extending from corners of transom to mid-ship on main deck and at aft of forecastle deck and are to be made of 8 mm thick steel plates with 150mm x10mm bulb plate or equivalent welded on top of bulwark. Vertical stiffening of bulwark is to be provided by profiles welded on deck with doublers.

Height of bulwark is to be not less than loadline rule requirement.

Freeing ports are to be arranged in main deck bulwarks to ABS Rule requirements. All transitions in the bulwark top are to be made as smooth as possible to avoid snagging the tow line. Freeing ports is to be lined with round bars to avoid chaffing of ropes.

15. Fenders

Heavy duty synthetic rounded hollow rubber fender of adequate size are to be fitted horizontally at the bow between main deck & f'cle deck level and below main deck level at the after end.

Suitable number of tyre fenders are to be arranged on ship sides. Lugs for installing the fenders are to be fitted.

25mm diameter (min.) galvanized chain are to be used to hold the tyres in position. Cut opening in the tyres are to be reinforced with pipe of approximate size which are to be held in to position by collar welded on both sides.

16. Deck Machinery foundations :

Deck machinery are to be mounted on steel foundation welded to deck. Foundations are to be well stiffened, designed for maximum load and reduced vibrations at ends.

Chapter IV

HULL – OUTFITTING / PIPING

1. Markings on Hull / Superstructure :

Vessel's Name, Draft Marks, Owners Mark (Fleet emblem), Warning Marks, Freeboard Marks, Tank Mark, IMO No. etc. are to be welded on appropriate places for hull and superstructure as per normal ship building practice and meeting the statutory requirements.

2. Bottom Plugs, Sea Chests and Bilge Wells :

All double bottom and peak tanks are to have drain plugs of stainless steel, sea chests are to be arranged on each side of the vessel for low and high level suctions. All sea water pipe work are to be constructed from thick walled material duly meeting ABS Rules.

3. Anchor Pockets and Hawse Pipes :

Anchor pockets suitable for anchors of high holding type are to be arranged on either side as shown in General Arrangement Plan. From anchor pockets to top of exposed fore castle deck hawse pipes of required size and thickness are to be fitted at angle to suit smooth anchoring operation.

4. Gutters, Bulwark, Railing, Cargo Rail and Eye-Plates:

In all accommodation areas and in bridge, gutters are to be arranged on the inside of outer bulkhead stiffeners. Gutters are also to be fitted on main deck on the inside of frame brackets in provision room and accommodation area. On main deck and fore castle deck bulwarks are to be arranged according to General Arrangement Plan. Access doors are to be arranged in outer railing on each side on main deck aft.

Freeing ports in bulwark are to be fitted duly meeting ILLC '66 Regulation. Railings on open deck are to be arranged as per General Arrangement Plan and to meet the requirements of ILLC'66 Regulations. On main deck a cargo rail is to be fitted on each side approximately 6000 mm from ship's centerline.

Steel eye-plates, 'D' Rings, guiding rollers etc. are to be provided as per demand of the services for which the vessel is to be designed. Eye-plates are to be arranged under the stern to facilitate fitting and removal of propellers, rudders and tail shafts. Eye-plates are to be welded directly to shell plating, cargo rail with local stiffening based on load bearing needs.

5. Stabilizing and Other Hull Tanks :

Two sets of passive stabilizing tanks are to be arranged below the main deck in the aft & forward regions for dual purpose incorporating in the water ballast / fresh water systems.

Fuel oil tanks, fresh water tanks, water ballast tanks, other miscellaneous service / settling tanks are to be arranged duly meeting efficient operation of the vessel, to be integral part of relevant hull and machinery piping systems.

6. Manholes and Access Ladders :

Access to all under deck spaces and tanks are to be arranged through manholes / man entry hatches duly meeting the requirement of ABS Rules. Ladders wherever necessary are to be fitted for easy access to all parts of the vessel including tank internals. All fuel oil storage, fresh water storage and ballast water tanks are to have two manholes each, subject to feasibility of fitment.

7. Machinery Rooms Flooring and Funnel uptakes :

The machinery rooms including steering gear platform are to have steel chequered floorings duly designed to reduce chances of accidental injury during operations.

The arrangement of exhaust pipe casing / funnel uptakes are to be in accordance with the requirement of machinery exhaust system duly meeting the requirement of ABS Rules.

8. **Watertight bulkhead doors** :

Two watertight bulkhead doors are to be fitted : one between main and auxiliary machinery rooms and one between main machinery room and engineers' store. These bulkhead doors are to meet SOLAS Regulation requirements and are to have both local & remote operations with alarm system duly meeting the damaged stability criteria.

9. **Weathertight Doors and Hatches** :

Hand operated weathertight doors with clear opening of 1400mm high by 650mm wide and coaming ht. of 600 mm applicable are to be fitted as shown on the General Arrangement Plan. They are to be able to control from either side. The doors are to have press button locking system from inside the accommodation to meet ISPS requirement.

Weathertight hatches are to be fitted on the main deck between bulwarks and cargo rails and two on fore deck, as shown on the General Arrangement Plan. All coamings are to be as per Loadline Regulations. Covers are to be of steel and to be capable of being opened and closed from inside and outside.

Hatch covers to be counter-balanced when marked as 'emergency escape' for ease of opening from inside. Weathertight doors and hatches to be fabricated to ISO / equivalent standard.

10. Masts :

The main mast is to be fitted with brackets for the navigation lights (mast head lights, NUC lights). Yard arm is to be fitted at suitable height to the main mast for suspending lights / shapes as per Colreg Regulation '72.

The fore mast is to be arranged to carry anchor and mast-head lights.

Masts are to have rungs carried on top, arranged for access to light trays and necessary fittings. Safety cage of steel is to be fitted.

Blocks for aerials, builder arms and ensign staff are to be fitted and sheaves for signals flags and shape hoists to be arranged on masts, as required.

Cable fastener, bolt, nuts, fittings, bar and steps are to be of suitable material.

11. Towing Bollard :

A towing bollard of SWL 50 tonnes is to be installed on the forecastle deck. Appropriate size panama-chock is to be fitted at the bow bulwark along the centerline to allow access for towing gear.

12. Bollard and Mooring Posts :

Double mooring bollards of heavy pipes are to be fitted on main and forecastle deck.

13. Cargo Rails :

Cargo Rail of 200mm N.B. heavy pipes is to be provided on main deck (P & S) as shown on General Arrangement drawing.

Height of the cargo rails is to be approx. 2500 mm to top of pipe.

14. Bilge And Ballast System :

The bilge and ballast systems are to be kept separated. All bilge and ballast pipes are to be of galvanized steel. One bilge water separator of suitable capacity and of approved design is to be installed in the auxiliary machinery room to fulfill MARPOL 73/78 compliance. Entire bilge system is to be of ABS approval. The bilge alarms are to be provided as required by ABS rules.

The ballast tanks are to be connected to a remote control ballast water system which is to enable transfer of ballast water between groups of tanks, in addition to pumping to / from sea.

15. Air, filling and Sounding Pipe System :

Air & filling pipes for built-in tanks are to be laid to open deck. Tank ventilation valves for oil tanks are to be supplied with flame arresters. Air, filling and sounding pipes are to be made and fitted in the entire vessel as per standard ship-building practice duly meeting ABS Rules. Air vents are to be of mushroom type. Sounding caps are to be made of brass.

16. Scupper and Discharge System

Scupper and discharge piping are to meet the demand of Sanitary/Toilet and other wet spaces as well as open deck outflow duly complying with relevant ABS rules and Marpol Convention, 73 / 78.

Chapter V

ACCOMMODATION

1. Accommodation Arrangement :

The accommodation is to be laid out to facilitate housing of 25 crew including master and 49 supernumeraries. The officers' accommodation are to include single berth cabins with attached toilets for Master, Chief Engineer, Chief Officer, 2nd Engineer and two-berth cabins with attached toilets for GMDSS Operator / NWKO and Electrical Officer & EWKO. The rest of the crew are to be accommodated in line with the requirement of relevant ILO convention requirements generally as shown in General Arrangement Plan. The 49 supernumeraries are to be accommodated in 3 single-berth cabins with attached toilets, 5 double-berth cabins with attached toilets and 9 four-berth dormitories with common toilets.

The accommodation layout is to complete with two conference rooms, officers' dining-cum-recreation room (also to accommodate single-berth / double-berth supernumeraries), crew mess room (to accommodate other supernumeraries as per status) 1 crew re-creation room, 1 two bedded hospital with full medical cabinet & one UV Steriliser, 2 offices, 1 central galley, refrigerated provision stores for wet provisions (meat / fish / vegetables), 1 dry provision store and laundry room with washing / drying machines. Entire accommodation are to be air-conditioned with 100% x 2 capacity for Air conditioning compressors. In addition, separate arrangement are to include one bosun store, paint store and 2 nos. project stores.

2. Galley / Pantry / Mess Rooms :

Details of equipments and layout duly meeting relevant ILO / Flag State Requirements are to be submitted to the Owners for approval.

3. Provision Stores :

Refrigerated and dry provision stores are to be arranged so that they are easily approachable from galley / accommodation of catering staff. The refrigerated store to be subdivided for meat product / fish and vegetables. The dry provision store is to be provided with suitable racks / bins for storing variety of dry provision.

The refrigerating plant for the provision rooms is to have two water cooled condensing unit and to operate fully automatic. Refrigerant to be used for the plant is R 404. Remote temperature readings of the provision stores is to be arranged in the galley. The entire refrigerating machine to have 100% redundancy for refrigeration compressors.

4. Laundry and drying room :

The vessel is to be arranged with laundry facilities with two washing machines, two tumble dryers, one stainless steel wash basin, one ironing table and one linen locker for use of ship-board complement. Provision for two additional washing machines to be provided.

5. Insulation / Paneling :

All outer bulkheads of steel as well as ship sides are to be insulated towards all accommodation / control stations with 100 mm thick resin bonded mineral wool. Insulation is to be calculated for an inner temperature of + 27 deg. C against max. external temperature upto + 45 deg. C.

Insulation / paneling materials are to be of approved type duly meeting the requirement of SOLAS 74/88 chapter II-I and acceptance under ABS Rules. In the accommodation spaces resin-bonded glass wool slabs / mineral wool slabs of approved quality depending on their requirement is to be fitted. The paneling boards used as partitions in the accommodation spaces are to be of 'B' Class. Steel

bulkheads / decks as applicable as per SOLAS provision are to be insulated to meet 'A' Class insulation.

The Insulation panels meeting SOLAS requirement for 'A' & 'B' type insulations including for 'A' & 'B' class doors and also for using resin-bonded insulation slabs, Heat affected bulkheads interfacing accommodation spaces e.g. funnel uptake sides, machinery compartment deck heads are to be laid with 32 mm A-60 fire rated magnesite insulation underlay and to be covered with polyvinyl tiles.

6. **Deck Covering :**

All exposed decks including cargo area on main deck are to be laid with moisture resistant, fast setting under polymer epoxy coatings of 8 mm thickness, covered with wooden planks or equivalent in working area.

Inside all cabins, dining spaces, conference rooms etc. are to be laid with 8 mm thick lightweight, fast-setting polymer underlay with decorative & durable vinyl chip flexible seamless 2 mm top coat.

All heat affected deck areas in way of galley, alleyway above machinery spaces, cabin floor above machinery spaces are to be laid with 32 mm A-60 fire rated magnesite insulation underlay and to be covered with vinyl / PVC tiles. Poly Spec 7K meeting SOLAS requirements is recommended.

Toilet, laundry spaces to be topped with antiskid ceramic tiles as appropriate.

All top layers are of type approval and to builder's standard, colours are to be approved by Owner.

7. **Window :**

Anodised aluminium framed type side scuttles and windows are to be arranged with appropriate thickness is to meet ABS rules.

Rectangular windows to be fitted in wheelhouse. One (1) window with clear view screen is to be provided at wheelhouse forward. Four (4) windows with windscreen wipers, two (2) at wheelhouse aft and two (2) forward are to be provided together with fresh water washing nozzles.

8. Panel Doors etc. :

Two (2) doors are to be fitted on port and starboard of bridge with fixed windows, of marine aluminium alloy.

9. Fire Protection Doors :

Fire protection doors are to be provided according to ABS rules and fire subdivision in accordance with provisions in SOLAS 74 / 88 chapter II-2.

10. Interior Doors :

Interior panel doors according to SOLAS regulations are to be fitted. Fittings are to be out of chromium plated brass.

11. Master Key System

Master Key System is to be installed according to international standard.

12. Partition Wall, Wall Linings :

Partition walls, panels and wall linings in all crew's, public and duty rooms as well as in the bridge are to be of fixed subdivision panels and all to SOLAS regulation requirements.

13. Ceilings :

Acoustic type standard ceilings for deck heads are to be installed and (colours are to be approved by Owner) to meet the SOLAS regulation requirements. Panels finishing and choice of colours to be as per Owner's requirement.

14. Window Boxes :

Window Boxes are to be fabricated from paneling material / GRP or aluminium.

15. Insulation :

Insulation (fire-, noise-, vibration protection) is to be applied to SOLAS regulations and international standard.

16. Furniture and Equipment for Bridge :

Bridge is to be equipped with all navigational instruments and electronics as specified elsewhere. Bridge windows to be arranged to give maximum visibility all round. Bridge arrangement drawing is to be submitted to the Owner for approval. Two (2) maneuvering control consoles with duplication of indicators are to be fitted one at forward and second at aft end of the Bridge. Both the control consoles are to be so arranged that the operator will have clear view for effective navigation of the vessel. A toilet is arranged attached to the navigating bridge as shown in General Arrangement Plan.

In addition to navigational and electronic electrical equipments otherwise specified elsewhere, the following items are to be supplied and fitted in the wheelhouse:-

- Flag lockers c/w one (1) set of International Code Flags and National Ensign.
- Two (2) binocular boxes
- Stainless steel storm rails on consoles

- Chart table with drawers under the with save-all end slit on table top edge for the charts
- Chart table lamp with dimmer
- Helmsman chair with arm rest, upholstered, adjustable in height and with foot rest
- Book shelf and racks of sufficient size
- Upholstered settee, hat pegs, coffee table and coat hooks
- One (1) anemometer
- One (1) air horn
- One (1) 30cm diameter brass ship bell, engraved with the Vessel's name, year of built and builder number, mounted at the starboard side bridge wing.
- Two (2) deck head mounted rudder indicators fitted above the aft and forward control consoles
- One (1) Quartz type battery clock
- Two (2) 2000W searchlight
- One (1) Aneroid barometer
- Two (2) inclinometer, bulkhead mounted type
- One (1) set Aldis signal lamp with chargeable battery (24 V)
- Two (2) sets hand leads
- Ten (10) numbers of 230V power points

17. **Furniture and Fixture**

Arrangement, design and size of the furniture are to be in accordance with the Builder's or Manufacturer's practice and approved by the Owner.

In general, material for furniture is to be of chipboard, plywood or solid hardwood depending on piece of furniture.

Surfaces of chipboard and plywood furniture are to be covered with hard plastic laminates of wood colours (Reposal, Perstorp, Formica or equivalent).

Top of all desks, tables, and other exposed top surfaces are to be covered with hard plastic laminates.

Fixed furniture is to be secured to deck or bulkhead. Provision is made to secure all portable furniture in rough sea.

For easy cleaning, sufficient space around the furniture is to be provided.

Fixed furniture is to be closely connected to bulkhead, floor and/or ceiling, in order to avoid small gaps and inaccessible areas.

18. Upholstery

- Upholstery is to be supplied.
- Mattresses are to be of foam plastics with spring.
- Mattresses cover are to be of cotton.
- Pillow is to be of foam plastics and covered with cotton.
- Cloth for sofa and chair is to be of vinyl leather/fabric.
- Stuff of seat of sofa and chair is to be of foam plastics.
- Curtain is to be of fabrics with fire retarding properties and shower curtain is to be of plastics.
- Curtain for windows facing bridge front is to be lined with light proof lining and all to have fire retarding property.

19. Hardware

- Hardware is to be of chrome-plated brass in general.
- Cylinder type locks are to be fitted for door of cabins, wardrobes and some of drawers in public space, living space, office space, etc.

- High security type locks are to be fitted to the doors exposed to weather in commissary space, sanitary space, sundry space, etc.
- Door lock for water closet is to be fitted.
- Door stopper with hook is to be provided.
- Coat and hat hook are to be fitted in each cabin and lavatory.
- Each door lock is to be supplied with three (3) keys.
- All keys are to be tagged.
- Pad lock is to be fitted to all steel weather tight door.
- A master key is to be supplied with three (3) spare keys.
- Spare keys cabinet is to be located in the Captain's cabin.

20. Cabin layout :

The accommodations are to be arranged for 25 officers & crew plus two (2) extra berths in the hospital. In addition, accommodation are to be arranged for 49 special persons.

21. Cabins for Captain & Chief Engineer :

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

- 1 built-in berths of 2000mm x 900mm x 150mm spring mattress with drawers and bunk light
- 1 desk with drawers and light, to also be used as Computer table.
- 1 built-in upholstered sofa
- 1 built-in wardrobe c/w shelf, hanger rod and hooks with lifejackets stowage on top
- 1 upholstered chair
- 2 coat hooks on back of door
- 1 keyboard (Captain only)
- 1 quartz battery clock
- 1 intercom telephone

- 1 x 4 drawer steel filing cabinet with locks
- 2 x 300mm dia. scuttles with deadlight covers
- 2 power points 230/1/50
- 1 Computer, TV, DVD player & Radio antenna socket
- 1 attached toilet
- 1 Domestic Fridge (65 ltrs.) to be fixed underneath the table.

22. One-berth cabins for officers / Supernumeraries on Upper Deck :

Five (5) one-berth cabins situated on Upper Deck are to be fitted as follows:-

- 1 built-in berth of 2000mm x 900mm x 150mm 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 lifejackets stowage on top
- 1 upholstered chair (folding type)
- 2 coat hooks on back of door
- 1 quartz battery clock
- 1 x 300mm dia. scuttles with deadlight covers
- 2 power points 230/1/50
- 1 TV & Radio antenna socket
- 1 attached toilet
- 1 Computer, DVD player socket (for three Special personnel cabins only)
- 1 domestic fridge (65 ltrs.) to be fixed underneath the table for 3 Special personnel.

23. Cabins for Crew / Supernumeraries on f'cle deck :

Eight (8) two-berth cabins and one (1) three-berth situated on the Upper Deck and on forecastle deck respectively are to be fitted identically as follows:-

- 1 x 2-tier berth of 2000mm x 800mm x 150mm mattress c/w bunk light, curtains, drawers under the ladder for the upper bunk

- 1 x 1 – tier berth (only for 3-berth cabin)
- 1 desk with drawers and light
- 1 built-in upholstered sofa
- 2 built-in wardrobes c/w shelves, hanger rods and hooks with lifejackets stowage on top (3 for 3-berth cabin)
- 1 upholstered chair (2 for 3-berth cabin)
- 2 coat hooks on back of door (3 for 3-berth cabin)
- 2 power points 230/1/50
- 1 Radio antenna socket
- 1 attached toilet

24. **Cabins for crew & supernumeraries :**

Twelve (12) four-berth cabins arranged on the deck, main deck & underdeck spaces are to be fitted identically as follows:-

- 2 x 2-tier berth of 2000mm x 800mm x 150mm mattress c/w bunk light, curtains, drawers under the ladder for the upper bunk
- Four (4) built-in wardrobes c/w shelves, hanger rods and hooks with lifejackets stowage on top
- 4 coat hooks
- 1 table/desk c/w drawers and light
- 1 upholstered chair
- 1 x 300mm dia. scuttles with deadlight covers
- 2 power points 230/1/50
- 1 Radio antenna socket
- 1 attached toilet

25. **Hospital**

One (1) hospital situated on the main deck and is to be fitted as follows:-

- 2 built-in berths of 2000mm x 800mm x 150mm mattress with drawers and bunk light (top half of the berth to be of reclining type)

- 1 examination desk with drawers and light
- 1 built-in wardrobe c/w shelf, hanger rods and hooks with lifejackets stowage on top
- 2 upholstered chairs (folding type)
- 1 medical cabinet (to relevant International standard)
- 2 coat hooks on back of door
- 1 quartz battery clock
- (hospital to be shifted to ship side)
- 2 power points 230/1/50
- 1 attached toilet
- 1 each I.V. stand, O₂ Cylinder and instrument locker
- 1 stretcher

26. Attached Toilets for Cabins :

Each toilet is to be fitted identically as follows:-

- One (1) WC pedestal c/w seat and lid, toilet roll holder and grab rail
- One (1) shower with hot and cold F.W. supplied, grab rail, curtain, soap dish and separate scupper drains
- One (1) washbasin with hot and cold F.W. supplies
- One (1) mirror with tray and light
- One (1) tumbler and toothbrush holder
- One (1) towel rail
- Two (2) coat hooks

27. Mess / Recreation Rooms :

One saloon-cum-recreation room for officers, one recreation room for crew / S.N. and one (1) mess room are arranged on the f'cle deck as shown on the General Arrangement Drawing these spaces 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) 230/1/50 power sockets
- One (1) sideboard with drawers
- One (1) cold water fountain
- One (1) 10-litres hot water urn
- One (1) coffee maker
- One (1) colour T.V. 29" c/w DVD player
- One (1) side board and cabinet
- One (1) Card Table for recreation room
- One carrom / chess board table for recreation room.

28. Service and Sanitary Area

In general, metal part directly contact with prepared food is to be of stainless steel and remainder of steel baked enamel.

Shelf and rack of hardwood or galvanized steel are to be provided suitably.

29. Central Galley

A Central Galley is situated on the main deck and is to be fitted out as follows:-

Sufficient lockers & storage racks to be provided.

- Two (2) electric cooking range with 4 hot plates 415 V. AC. 3 phase and 1 oven (western type)
- One (1) refrigerator, not less than 500 litres (Refrigerant 404A/R22)
- One (1) freezer, not less than 290 litres
- One (1) dresser, stainless steel top and 2 deep sink
- One (1) cooking table, stainless steel top
- One (1) dish shelf
- Two (2) serving tables, stainless steel top

- One (1) Dow kneading machine (I)
- One (1) Mixer / Grinder (I)
- One (1) Toaster large (I)
- One (1) Flour Grinder (I)
- One (1) Mincer (I)

30. Refrigerated Fish/Meat & Vegetable Rooms :

The Refrigerated provision stores are to be cooled by a fully automatic refrigerating plant with seawater cooling pump. Deck, sides and deck head are to be insulated with pre-fabricated panels. Thickness and type of insulation are to be in accordance with the recommendation of the manufacturer for the refrigeration machinery and to the Owner's approval.

The door is to be stainless steel insulated door with door alarm connected to the wheelhouse and able to open from inside.

Freezer room (Fish / Meat room) and Vegetable room to have self-defroster.

Temperature range - 18°C for freezer room(-5°C for Vegetable room)
 + 4°C for cool room

Audio-Visual Alarm for malfunctioning of refrigeration equipment to be provided in Central galley.

31. Dry Provision Store :

Provision store is to be provided and equipped with shelves. The room capacity is to be sufficient for the period of thirty (30) days. Forced supply and natural exhaust ventilation to be provided.

32. Laundry-cum-Drying room :

This compartment situated on the main deck and is to be fitted out as follows:-

- Two (2) automatic 10-kg. washing machines
- Two (2) dryers with extraction connected to outside of the compartment.
- Two (2) stainless steel tub
- Two (2) ironing boards
- Two (2) irons
- Four (4) 2-tier steel cabinet
- Five (5) power points, 230/1/50Hz

Necessary shelve lockers for storage of laundry are to be provided.

33. Air Handling Room

One (1) central Air Handling Unit (AHU) Room to be provided to house the air conditioning unit is to be located as per the General Arrangement Plan. Lighting, ventilation ducts and scupper pipe to be provided.

34. Bosun Store, Paint Store, Project Store etc.

The Bosun store, Paint store and Project store are situated at forward main deck level and are to be fitted out with timber shelves on steel frames. Lighting and natural ventilation to be provided.

35. Bow Thruster Room

This compartment is to be fitted with bow thruster machinery with suitable forced ventilation. Flooring to be 5mm thick steel chequered plates. Athworthship of Bow thruster Room are to house sprinkler tank / pump for paint store on stbd side and emergency fire pump on port side.

36. Machinery Rooms :

The main & auxiliary machinery rooms are to house the main engines, generators, pumps and compressors facilitate easy access for operation and maintenance. Machinery with exposed moving parts, which constitute a potential danger to

personnel is to be protected with screens, handrails or both. All wet and/or slippery areas are to be provided with non-skid walking surfaces.

Engineers' store and Electricians store is to be provided with bins or shelves, or other storage means for keeping spares and is arranged between main machinery room and S.G. compartment with direct access for S. G. Compartment.

5mm thick steel chequer floor plates fastened by stainless steel countersunk screws are to be laid.

37. Steering Gear Compartment

Steering Gear Compartment is to be fitted with necessary steering machinery. Sound powered telephone.

Mushroom-head forced ventilator and communication are to be provided in this room and to meet rules and regulation requirement.

Mechanical Rudder angle indicator is to be arranged on rudder stock and electrical type also on bridge consoles.

Alarms for failure of main steering system are to be provided in bridge consoles as well as in MCR.

38. Emergency Genset Room

The emergency genset room is situated on main deck as shown in General Arrangement Plan.

39 CO₂ Room

CO₂ room is situated on the main deck as per General Arrangement Drawing and is to store the CO₂ bottles and is to be outfitted to meet the ABS rules and SOLAS regulation requirement.

40. The following items are to be supplied and installed on board the Vessel and are to be of suitable size and capacity:-

- Clocks (for cabins, public rooms, wheelhouse, engine room, etc.)
- Refrigerators (for public rooms, captain room, chief engineer room, 3 special person cabins)

41. Flag, Signal, Signal Light

Flag, Signals and Signal Lights are to be in accordance with international rules and regulations, at least the following items are to be supplied:-

- One (1) set ship's call flag
- One (1) quarantine flag
- One (1) pilot flag
- One (1) set of Alphanumerical flags.
- One (1) hand signal flag, red and white
- Six (6) national flags
- Two (2) sets of international flags
- One (1) daylight signaling light (portable type)
- One (1) Call sign light
- One (1) ship's bell, 300mm dia. (with ship's name and date engraved thereon)
- One (1) mechanical fog-horn (hand type)

42. Canvas Covers :

All open deck equipments such as winches, signal lamp controller and etc. are to be covered with high quality water repellance canvas.

43. Carpentry Tools (Owner Supply)

A set of carpenter's tools are to be provided as per following list:-

- Two (2) carpenter's chisel bevel edged 19mm, hollow 13mm
- One (1) gimlet
- One (1) sledge hammer 6 kg.
- Two (2) hand hammers 0.5 kg., 0.9 kg.
- One (1) claw hammer
- One (1) large wood hammer
- One (1) axe
- One (1) hatchet
- Three (3) fids, 45mm dia. x 300mm, 55mm dia. x 380mm, 60mm dia. x 460mm
- Three (3) marine spikes, 20mm dia. x 200mm, 25mm dia. x 350mm, 30mm dia. x 50mm
- Two (2) serving mallets
- Two (2) serving boards
- Two (2) palms
- Four (4) rust hammers
- One (1) big scraper
- One (1) triangular scraper
- Six (6) scraper
- Two (2) hand steel brushes
- Two (2) squeegees
- Two (2) mops (linen type)
- Two (2) mops (sponge type)

- Two (2) coir brooms
- Five (5) paint pots, two (2) for 3 litres, three (3) for 2 litres
- Two (2) paint brushes with long handle
- Six (6) paint brushes, flat type
- Two (2) long tar brushes
- Two (2) crow bars, 25mm dia. x 1200mm long, 30mm dia. x 1500mm long
- One (1) shifting spanner
- Five (5) common spanners double head
- One (1) plier
- Two (2) hand tin snips, straight pattern, circular pattern
- Four (4) screw drivers
- Five (5) scoops
- One (1) spade
- Three (3) sharpening stones, coarse, medium, fine
- Two (2) cork fenders, 600mm dia.
- Six (6) rat guards for mooring ropes
- Two (2) oilers
- One (1) water funnel
- Two (2) hand saws
- One (1) lamp scissors
- Two (2) oil funnels
- One (1) oil measure, 3 litres
- One (1) bench vice
- One (1) hand grinder
- One (1) breast drill
- Two (2) spanners for sounding cap
- Four (4) spanners for bottom plug
- Four (4) spanners for side scuttle glass
- Two (2) sounding rods, four (4) folding type with wire rope
- Two (2) steel measuring tapes for sounding pipe
- One (1) can hook
- Two (2) bosun's chairs with block and halbuilder

- Two (2) paint stage for hull painting
- One (1) buoy strop
- Two (2) heaving lines for mooring
- Three (3) chain stoppers with turnbuckle
- Three (3) anchor stoppers
- Two (2) spare bottom plugs
- Three (3) spanners for manhole cover
- Five (5) spare glasses for side scuttle
- Five (5) spare glasses for square windows
- Four (4) steel blocks
- One (1) single sheave tackle
- One (1) double sheave tackle
- Two (2) wooden blocks (Single sheave)
- One (1) cargo hook (3 tons)
- One (1) shackle
- One (1) snatch block for mooring
- One (1) set lifting tackles
- One (1) hand drill with drill bits
- One (1) Electric drill
- One (1) set of tested Shackles of different sizes
- One (1) set of chain blocks of various capacity.
- One (1) 4-way sling
- Two (2) plastic round containers to carry FC Plans.

44. General Purpose Hoses :

Length of the following hoses are to be of suitable size:-

- Four (4) rubber hoses for deck cleaning and washing
- Two (2) air hoses for miscellaneous use, with nozzle
- One (1) bunker hose
- One (1) FW hose

45. **Boxes and Sundry :**

The following items are to be supplied and/or installed at suitable locations with appropriate size:-

- Two (2) binocular boxes
- Two (2) frame for general arrangement
- One (1) frame for capacity plan
- One (1) frame for bilge and ballast system
- Three (3) frame for fire control plan
- Three (3) frame for fire & boat station
- SOPEP locker and equipment as per Classification requirements are to be furnished and installed.
- **F.O. and F.W. flow meters with test and calibration certificates**

46. **Accommodation Stores (Owner's supply) :**

The following items are to be supplied by owners,

- Mattresses & pillows
- Linen
- Curtains
- Loose items, if any.

Chapter VI

MAIN MACHINERY & SYSTEM

1. Main Engines :

The vessel is to be powered by 2 no. Caterpillar make, model 3516B, V-16 four stroke marine diesel engines each developing 2000 bhp (1491 kw) @ 1600 rpm, giving a total of 4000 BHP A rating power. The engines are turbocharged & after-cooled units to be operating on diesel oil.

2. Each Main engine is to be equipped with air starting arrangement, duplex oil and fuel filters, deep sump oil pan, spark arresting type muffler, instrumentation & safety alarms / shutdowns. The Main engines are to meet MARPOL '73/78 Annex - VI emission requirements and are to be supplied with EAPP Certificates. Fuel, Cooling pumps and other accessories required for operating the engines are to be as per Engine manufacturer's standard. In case of failure of these main engine auxiliaries, provision to be made as per classification society requirements and manufacturer's standards only. Each main engine is to drive a shaft generator of 350 KW each from respective gearbox output shaft. Provision is to be made for shaft brakes for controlling vessel's movement in congested water / heavy traffic zones or in exigency of situation. Special tools required for overhauling of main engines are to be provided.
3. The main engines are to be engaged to marine CPP gear boxes of suitable gear ratio, with built in hydraulic clutches, thrust bearings, couplings to drive 2 nos. controllable pitch propellers of suitable diameter. However final selection of gear ratio and propeller parameters shall be decided on the basis of final design / data provided by the designer.
4. Fuel oil system, sea water & fresh water cooling systems, lubricating oil system, air starting system, exhaust system for operation of main engines are to be designed in accordance with manufacturer's requirement duly meeting ABS Class rules including compliance of operational safety requirements as per SOLAS '74/88 chap. II-1. The

exhaust gas system is to consist of exhaust gas silencer, insulation, drainage etc. Adequate capacity of air receivers for starting the main engines are to be arranged meeting ABS Rules for number of starts. The exhaust to have spark arrestors.

5. **CP-Propeller System** :

Two sets of four bladed controllable pitch propellers make Scana Volda, model ACG 62 / 525 of Nickel aluminium bronze or equivalent are to be powered by main propulsion engines through Marine reduction gearboxes through hollow-bored forged steel tail shafts.

The system has the control functions of pitch control, rpm control and clutch control. Each gear boxes are to be equipped with built-on oil system. Drainage to the dirty oil tank is to be arranged by means of stand-by lubricating oil pump.

Each of the forged steel tail shaft is to be sized meeting ABS Rules requirements. The builder is to furnish and install a complete twin screw controllable pitch propeller system. Pitch indicators to be provided on the bridge.

Propeller blades is to be Ni-Al bronze and hubs is to be in Ni-Al Bronze or Stainless Steel with all SS bolts. The entire CP propeller system (Push Rod System) is to be designed, built and installed to meet ABS standards.

The hydraulic system is to be integral part of Gearbox LO system and an electric standby lube oil pump for each shaft-line.

Changing of propeller blades are to be effected in dry-dock.

One (1) set of spare propeller blades, one blade LH and one blade RH are to be provided. Rotation of Propellers are to be outboard turning looking from aft end.

Two fabricated mild steel sterntubes are to be supplied and fitted, secured at the bulkhead and at the 'A' frame boss. Each is to be fitted with a cast iron white metal lined bushes and arranged for oil lubrication.

The sterntubes are to be fitted with seals, all in accordance with CP Propeller manufacturer's standards.

Two (2) sterntube oil tanks, are to be fitted and arranged, one to be feed each tube by gravity.

The tanks are to have air release arrangements, an oil level gauge, and low level alarm provided.

Two (2) four bladed controllable pitch propellers of suitable diameter to be supplied, one RH and one LH.

Propeller material to be of approved nickel aluminium bronze and are to be manufactured to standard finish of propeller as per IS R484, Class 1 and statically balanced.

Propeller to be designed to give speed and performances as specified.

A torsional vibration analysis of shafting system is to be prepared by the engine manufacturer and to be submitted to the Owner after approval by ABS.

Special tools for overhauling for CPP are to be provided as per manufacturer's standard supply. Eye plats to be welded on hull for removal of propeller blades.

6. Shaft Generators :

2 nos. shaft generators make Leroy somer model 47.2 L-9 / 4 P each of 350 kw are to be arranged from gear boxes power take off via flexible couplings. Each generator is to be equipped with : anti-condensation heaters, excitation equipment (AVR), winding temperature sensors, bearing temperature sensors and transformers for differential protections. Main generators will be capable for starting and running bow thrusters independently.

7. Steering Gear :

Maneuvering of the vessel is provided by electro-hydraulic ram type steering gears make Kobelt model 7094-U30 of adequate capacity (approx. 2 x 5 mtr. tonnes) with two pumps and Mechanical Tie bar to operate 2 nos. spade type flap rudders (high lift).

The control panels and rudders indicators for rudder to be fitted in forward and aft bridge control stations.

Emergency Steering to be provided.

Steering failure alarm to be provided

The entire equipment, arrangement, stand-by system, emergency system and control system including performance criteria are to meet ABS Rules.

8. Rudder and Rudder Trunks :

Two (2) rudders of high performance streamline type are to be fitted each with an approved area. The rudders are to be watertight streamlined, double plate type, fabricated of mild steel, with internal horizontal plate frames.

Suitable lifting arrangements are to be incorporated and filling and drain plugs fitted.

The plate frames to have limber holes to ensure internal drainage.

After testing, the rudders are to be filled with corrosion protection "Falchem" solution and drained.

All plug welds are to be faired with cement composition.

A lifting eye and anti- jumping ring to be fitted to each rudderstock.

The rudder stock is to be of forged steel or equivalent. Special spanner for Rudder stock / Rudder fitment nuts is to be provided.

The rudder trunk is to be tubular steel, with a heavy plate to take the steering gear and watertight gland. A heavy steel boss to be incorporated at the lower end of the trunk and fitted with approved type bearing. The bearing and stock to be designed to take the full side load of the rudder.

Hull is to be subdivided into number of under-deck compartments as per General Arrangement Plan which include auxiliary machinery room, main machinery room, steering gear compartment, accommodation space for special personal etc.

The builder is to ensure that supervision during the construction of hull is of highest quality and that the sub-contractor employed have adequate qualified supervisors having long experience of ship construction and full knowledge of the requirements of inspection and testing by Surveyor from major Classification Societies. The builder is also to ensure that more than adequate attention are given to difficult construction blocks e.g. aft structure, forward structure, double bottom in way of machinery foundations etc.

9. Bow Thrusters :

The vessel is to be fitted with 2 nos. electric motor driven bow thrusters make HRP, model HRP 2000 series type : HRP 2001 TT of 200 kw each of Fixed pitch type for improved Maneuverability. The bow thrusters are to be arranged for bridge control having main control panel in aft bridge console and a slave control panel in front bridge console.

10. Layout of Main Machinery Room :

The layout plans of main machinery room, steering gear compartment and bow thruster room are to be arranged for congenial working space for the ship-board crew. The arrangement during the development of design are to be prepared in consultation with main machinery suppliers and is to be sent for owners approval.

Chapter VII

AUXILIARY MACHINERY & SYSTEM

1. Main Generator Sets :

The vessel is to be equipped with two sets of diesel engine driven 350 kw , **440V** , 3 phase, 0.8 pf, 50 Hz marine generators of Make Caterpillar, Model C -18 to provide power for entire ship-board operational needs (including bow thrusters) and accommodation demand. The generators are to be connected to Main switch-board and are to be flexible mounted to the vessel's structure.

One diesel driven emergency generator Make Caterpillar, Model C - 4.4 of **100 KW, 440V**, 3 phase, 0.8 pf., 50 Hz and an emergency switchboard is to be arranged on main deck accommodation aft end as shown in the General Arrangement Plan. This set to have dual starting arrangement with provision of auto starting.

Emergency load calculations to be submitted to justify the size of the emergency generator. Any change in capacity is to builder account.

2. Air Compressors :

The vessel is to be fitted with two main electric motor driven air compressors Make Sperre, Model TSHL74 2 HL2/77 of adequate capacity to feed two main air receivers. In addition one Service Air compressor of 250 cu.m capacity @ 10kg/sq.cm is to be arranged to feed the Service air receiver. The entire compressed air system including providing service air, actuating air whistle etc. are to meet the ABS Rules. One diesel air compressor of suitable capacity (ABS requirement) to be provided for dead start.

3. **MARPOL Compliance Equipment** :

Two sewage treatment plants Make Hamworthy, Model ST6A duly meeting Annexure – IV requirements, one incinerator duly meeting Annexure – VI requirement are to be arranged on-board. These equipments and their installations are to meet ABS Rules.

4. **General Service / Bilge / Ballast / Fire Pumps** :

The auxiliary machinery room is to house the entire sea water piping systems including general service pump, bilge pump, ballast pump, fire pump of capacities meeting ABS Rules / Flag Administration Requirements. The ballast pump is to act as emergency bilge pump for both main and auxiliary machinery rooms. Machinery rooms to have high level bilge alarms. All the pumps are to be centrifugal type, electric motor driven. Bilge pump will be reciprocating type. Sea chest connections, piping and valve fittings are to be arranged for efficient operation of the vessel.

5. **Oily Bilge separator**

One oily bilge separator Make Hamworthy, Type HS 0.5 (M) is to be arranged meeting the latest MARPOL 73/78 requirement is to be arranged in the auxiliary machinery room for handling the entire engine room bilges.

6. **Auxiliaries:**

Following Auxiliaries to be arranged as per ABS/ ILO/ Flag State requirement as applicable.

- Two Reverse Osmosis F.W. Water Makers of capacity 10 tonnes per hour are to be arranged in the auxiliary machinery room.
- One calorifier of adequate capacity
- One diesel oil purifier
- One lube oil purifier
- Two fresh water hydrophore pump
- One sea water hydrophore pump with stand by arrangement.

- Electric motor driven Bilge / fire pump of capacity 45 m³ / hr at 25 MWC
- Electric motor driven ballast pump of capacity 60 m³ / hr at 25 MWC
- Electric motor driven fresh water hydrophore system of capacity 20 m³ / hr at 20 MWC with standby pump
- Electric motor driven Sea water hydrophore pump of capacity 20 m³ / hr at 20 MWC with standby pump.

7. Engine Room Workshop :

The vessel is to be provided with a small workshop with one lathe, one drill machine, welding rectifier, bench grinder and other necessary tools in one of the machinery rooms.

8. Machinery Space Ventilation :

The machinery compartments are to be arranged for mechanical mini-duct high speed ventilation system, air Support to meet ISO 8861 standards. Bow thruster compartment is to have independent ventilation Support fan.

Chapter VIIIDECK MACHINERY & EQUIPMENT**1. Passive Anti-Roll Stabilizing System :**

An anti-roll system is to be installed using two 'U' tanks in the aft part of hull. The damping device in the tanks are to be arranged with suitable structural design. The system is to have bridge instrumentation to indicate rolling period of the vessel.

2. Anchoring and Mooring Equipment :

The vessel is to be equipped with 2 nos. 1440 kg. HHP anchors, to be attached to stud link chain cables (2 x 14) lengths with necessary shackles, swivels and links. One electro-hydraulic controlled anchor windlass is to be fitted with two cable lifters, two warping heads, powered by hydraulic motor controlled system to operate anchors. Two chain stoppers of roller type suitable for stud link chain cable are to be fitted.

The vessel is to be fitted with 2 nos. PLIMSOLL make electro-hydraulically operated 5 t capstans of adequate capacity arranged on main deck aft on both sides. Reasonable distribution of fixed bollards, roller fairleads are to be distributed on exposed deck, layout of which to have prior approval of the Owners.

Entire anchoring and mooring equipment arrangement are to meet ABS Rule requirement for relevant Class notations.

Sufficient number of bollards and fairleads are to be provided.

Mooring lines	:	4 x 220M long mooring ropes of min. 105 KN breaking strength (polypropene) (8" circumference)
Tow line	:	1 x 200M long towline of min. 277 KN breaking strength (polypropene)

3. **Deck Cranes** :

The vessel is to be fitted with SORMEC or equivalent Make Marine deck crane with foldable boom.

A smaller deck crane Plimsoll Make of 5 t SWL @ 10 mtr outreach will also, be fitted by builder on the opposite side of the main deck crane near midship region.

4. **Tugger Winches** :

2 nos. 10 t tugger winches Plimsoll Make with 150 m. wire drum capacity are to be fitted and to be powered from a central power pack of electro-hydraulic system on-board.

Chapter IX

CONTROL SYSTEM FOR MACHINERY

1. Controls :

Main Engine controls are to include remote control panels for main engines / propellers, push buttons for start / stop of main engines and all other measuring and control levers as per recommendations of machinery suppliers and duly meeting ABS Rules. List of controls to be provided.

Bridge controls are to be arranged with forward console and aft console.

2. Alarm System :

The alarm plants are to be arranged both in engine room as well as in bridge in accordance with the requirement of machinery / equipment suppliers, ABS Rules.

The purpose of the alarm system is to provide warning and monitoring of important parameters on the main engine and propulsion as well as on the auxiliary equipment.

Proper method is to be provided to allow the operator to monitor the functioning of automatic control procedures and to resume manual control (overriding principle) at any time.

3 Alarm Device

In the machinery rooms, the separate alarm indicating panels are to be provided, which consist of:-

- General alarm
- Machinery alarm

- Fire alarm
- CO₂
- Telephone

4 Engine Performance Monitoring

Performance monitoring consists of the following measurements:-

- Engine speed
- Temperature of engines
- L. O. Pressures of Engines
- Gearbox lub oil pressure

5 Fire Detection and General Alarm System

The accommodation, machinery rooms and service spaces are to be provided with a fire/smoke detection and alarm system as per ABS Rules and flag state rules.

Alarm bells are to be sited within accommodation in accordance to ABS requirements. Break glass alarm points are to be fitted in Bridge, main deck, thruster compartments, forecastle deck and machinery rooms. An alarm horn and revolving red light are to be installed in the machinery rooms and an alarm horn only fitted in the steering gear compartment. An engineer alarm system to be provided in Chief Engineer's Cabin and 2nd engineer's cabin.

A fire detection system based on the self-monitoring principle including periodic testing facilities is to be installed in the machinery spaces and accommodation. It is to be fed automatically from an emergency source of power by or separate feeder if the main source of power failed. The system is to meet SOLAS 74 / 88 regulation requirements.

Chapter XNAVIGATION & COMMUNICATION EQUIPMENT1. Navigation Aids :

The vessel is to be fitted out with following navigation equipments of representative technical details primarily housed in the Bridge :-

- i) S Band (10 cm) ARPA Radar
- ii) X Band (3 cm) Radar / with ARPA
- iii) Doppler Speed Log
- iv) Echo Sounder Transducer
- v) Gyro Compass with two Repeaters
- vi) Magnetic Compass with azimuth mirror (with spare compass bowl)
- vii) Aneroid Barometer
- viii) Anemometer (wind speed & direction)
- ix) Electronic / Electrical Whistle with standby battery
- x) Air Whistle
- xi) PA Talk Back System
- xii) SP Telephones (Engine Rooms, Steering space, Crane control cabin)
- xiii) PABX System (Intercom)
- xiv) Clinometer, Sextant, Marine Binoculars, wet & dry bulb thermometer, ship's clock, Parallel Ruler etc. as per standard ship-board items.
- xv) Auto Pilot to be fitted with off course alarm.
- XVI) AIS AND SSAS
- XVII) GPS CONNECTED TO THE RADAR.

All above equipments are to be provided one set each.

2. Communication Equipment :

The vessel is to be fitted out with following Communication equipments primarily housed in the Bridge :-

- i) MF / HF Transreceiver with DSC Watchreceiver
- ii) VHF / DSC
- iii) DGPS with Plotter
- iv) INMARSAT C – 2 sets
- v) NAVTEX Receiver
- vi) 2 – way Radio Telephone – 3 sets
- vii) EPIRB
- viii) Additional VHF
- ix) Additional SSB with output 250 watts.
- x) DAIS / UAIS with AC / DC Support unit
- xi) SART
- xii) UFC : Walkie Talkie – 4 sets
- xiii) Fax, telephone & e-mail facility at additional cost.

All above equipments are to be provided one set each unless stated otherwise.

Chapter XI

SAFETY EQUIPMENT

1. Life Saving Appliances :

The vessel is to be equipped with one semi-inflatable rescue boat (10 men Zodiac / 25 bhp OBM) to be operated by single-arm davit of approved type duly meeting the flag state requirement.

The vessel is to be fitted with adequate number of inflatable life-rafts arranged on both sides of total capacity to meet the flag state requirements.

The other Life Saving Appliances including Life-buoys, Life-jackets, Line throwing apparatus, distress signals, immersion suits, TPA etc. are to be provided to meet full compliance of safety requirements for 74 all-soul on-board. If exemption is required for life boats the yard shall facilitate full cooperation for obtaining dispensation for flag state.

Major Life Saving Equipments are stated as hereafter:-

- a. 1 no. Inflatable Rescue Boat with Davit
- b. 10 nos. 20 men and 2 nos. 12 men Inflatable Life Raft
- c. 1 set portable Radio Telegraph equipment for survival craft
- d. 1 no. float free EPIRB
- e. 1 no. SART
- f. 4 nos. 2-way Walkie Talkie set (as already mentioned in Ch. X, Cl. 2)
- g. 12 nos. Parachute Distress Signal
- h. General Emergency Alarm throughout the accommodation space and ER.
- i. 1 no. Line Throwing Appliances (set)
- j. Balance Life Saving Appliances to be as per latest SOLAS

2. Fire Fighting Equipments :

The engine room is to be equipped with CO₂ fixed fire fighting system to meet the Flag State Requirements.

Main fire system is to be arranged for the entire vessel in accordance with SOLAS '74/88 and Flag State Requirements.

Fire main is to be provided with instantaneous couplings and laid out with fire hydrants adequately covering entire working / living areas on-board ship with special emphasis of fire prone zones including engine room. An emergency fire pump (diesel engine driven) is to be arranged in steering gear compartment and to be connected to fire main in accordance with SOLAS 74/88 requirements.

A central fire detection alarm system is to be mounted in the bridge with slave control in machinery control room. The fire detection system is to be arranged with heat detectors in accommodation, engine room, air conditioner room, with smoke detectors in accommodation and engine room.

Fire extinguishers, fire axes, fireman's outfit are to be arranged including EEBD in accordance with requirements of Flag Administration.

Major Fire Fighting Equipments are stated as hereafter :-

- a. Engine Room to be provided with fixed CO₂ fire extinguishing system
- b. Accommodation space and Engine Room to be fitted with fire detection and alarm system including manually operated call point.
- c. Accommodation space to be fitted with sprinkler system.
- d. Paint Locker if area above 5 sq. m to be fitted with CO₂ fixed fire-extinguishing system.
- e. 9 nos. EEBD to be provided.
- f. Foot op. bellow type breathing apparatus & SCBA

All Fire Fighting Equipment to be as per latest SOLAS.

3. Light & Sound Signals. :

The vessel is to be equipped with navigation lights, shapes, sound signals to meet Colreg'72 Regulations to the satisfaction of ABS / Flag Administration.

Light & Sound Signal Equipment are stated as hereafter :-

220V / 24V Light as below: -

All navigation lights shall be of 2 tier type.

- i. 2 nos. Masthead Light
- ii. 1 nos. Side Light
- iii. 2 nos. Anchor Light
- iv. 1 no. Stern Light
- v. 3 nos. all around Red Light
- vi. 1 nos. all around White Light
- vii. 1 no. Electric Whistle
- viii. 1 no. Compressed Air Whistle
- ix. 1 no. Ships Bell
- x. Balance LSS as per COLREG, 1972 as amended 1991.
- xi. 1 No. Towing Light

Chapter XII

ELECTRICAL SYSTEM

1. Common Electrical System :

The vessel is to have alternating current system, 3 - phase, 50 Hz with insulated neutral as the main system. The installation is to be according to IEC norms. 415 V and 230 V systems are to have earth failure instruments with alarm output. 24 V DC is to have earth failure relay with indication lamp or alarm output.

All 1- phase consumers is to be distributed as equally as possible on the 3- phases. The arrangement of the electrical equipment throughout the vessel is to be such to provide ready and safe access to parts required for inspection, maintenance and repair as far as practicable. The vessel's electrical power sources is to be : two Main Generators of 350 KW each, two Shaft Generators of 350 KW each and one Emergency Generator of 69 KW.

All metal parts of electrical installation, other than current carrying parts is to be earthed, as required. All electrical system is to be conspicuously marked, emergency signs is to be put up as per standard ship-building practice.

2. Electrical Motors, Transformer etc. :

Motors are to be of induction marine type generally having squirrel cage rotors. Motors having high / low torque and / or high / low current starting characteristics are to be employed only where necessary to ensure satisfactory starting, or to minimize the starting duration of a duty or to restrict Support voltage transients. Insulation is to be Class 'F' but where a motor is specially designed to suit the driven machinery, maker's standard is to be followed.

Transformers are to be of dry, natural, air-cooled marine type, temperature Class 'F'. windings are to be treated to resist moisture, sea, air and oil vapors. Two 415 / 230 V

3 – Phase transformers of approximately 45 KVA and one 415 / 230 V 3 – phase transformer of approximately 12 KVA for emergency switch board are to be installed.

3. DC System :

Main 24 V DC systems are to be separated in two independent parts. Cross connection for redundancy is to be fitted. Battery chargers are to have capacity to power both the systems simultaneously. The battery chargers are to be capable of automatically maintaining the 24 V batteries in fully charged conditions. Power Support to the chargers is to be from 230 V emergency system.

Entire DC system is to cater for all navigation and communication equipment in line with the maker's recommendations and provisions of SOLAS 74/88.

4. Main Switchboard :

The switchboards are to be designed for free standing mounted on a common base frame with vibration dampers. Bus-bars and other conductors are to be made of copper. All switchboards are to have available space for future installation of Moulded Case Circuit Breakers for outgoing feeders. The main switchboard is to operate two Main Generators, two Shaft Generators, connected to Bus-bars.

The Panel is to be complete with control equipment and protection equipment. The necessary synchronizing device and lamps for manual synchronizing are to be installed. A separate synchronizing panel including remote control of main switchboard is to be installed in engine control room console. 415 V Shore connection is to be connected to Main switchboard. The shore connection is to be interlocked with Generator breakers. All safety cut outs as per ABS rules are to be provided

5. Emergency Switchboard :

Emergency switchboard is to be installed closed to emergency generator. The switchboard is to receive 415 V Support from main switchboard. A failure in normal power system is to start the emergency generator automatically and connect it to emergency switchboard. 230 V emergency switchboard panel is also to be integrated.

6. Starters / Emergency Stop System :

The starters are to be installed locally close to corresponding motor. Starters for stand by pumps are to be remote control from the engine console. Thruster motors are to have start / delta starter. Emergency stop switches in Bridge is to be arranged for : fuel oil pumps, fuel oil purifiers, ventilation fans for accommodation as well as engine room. The push buttons are to be protected from accidental operation. Emergency stop for each main engine are to be arranged on forward and aft bridge consoles. Emergency stop for bow thrusters are to be arranged on thruster panel. Entire system is to have approval of ABS Rules.

7. Distribution Panels :

All distribution panels are to be made of aluminium or primed steel with painted surface. Distribution panels are to be provided for 415 V, 230 V and for 24 V DC.

8. Electric Cable Installation :

All power Support cables throughout the vessel are to be of ABS approved material. Cables in general are to have multicore and multistranded construction excepting for co-axial cables. Cables in general are to have copper conductor and XLPE or EPR conductor insulation. Cable installation is to be minimized on the open deck. Wiring throughout the vessel are to be carefully arranged to eliminate fire risk. Cables liable to be exposed to mechanical damage are to be protected suitably. Cables are to be effectively supported and secured without damaging their outer coverings. Cable hangers are to be made of steel with corrosion resistant finished. Where cables

passed through watertight bulkheads or decks, watertight stuffing glands, or boxes for multitransit arrangement are to be used. Major Cable trays, bulkhead and deck penetrations are to have spare capacity for future installations.

9. Light Fittings :

The light fittings in machinery rooms, accommodation spaces, open deck spaces are to be arranged as per standard ship-building practice duly meeting ABS Rules / Flag State Requirements.

Six flood lights of 1000 W each, One search lights of 1000 W is to be arranged for night operations.

10. Electrical Tools :

Appropriate electrical tools are to be stowed in the electrical store arranged underdeck adjoining the engineer's store.

Chapter XIII

MATERIAL PROTECTION & LABELLING

1 Sand Blasting, Prime Coating

All steel surfaces are to be gritblasted / sandblasted and painted with a shop primer of an approved manufacturer. Before application of the first coating the area is to be cleaned, sharp edges are to be ground and damaged areas, welding seams, etc. are to be prepared.

2. Conservation of Materials

A full strip coat of all welds, edges, drain holes, lighting holes and hard-to-reach areas are to be carried out prior to the application of the first coat. Any damaged areas are to be recoated with the full coating system.

All pipes, fitting and equipment contact areas are to be coated with the full coating system and are to be inspected before commencement for installation of equipment, fitting and piping. Dry film thickness (DFT), as specified, is to be interpreted, as the minimum required.

All coatings are to be applied in accordance with maker's standard requirements and approval. Before the commencement of application, the area/systems are to be put to the Owner's acceptance.

Painting system is to allow Vessel to operate upto 3 years without docking.

The Builder is to prepare painting procedures and Specifications for the Owner's approval / guidance.

3. Paint Specification, External

Area	Dry Film Thickness
<i>Bottom and boot top</i>	
Epoxy	1 x 125 microns
Vinyl Tar	1 x 125 microns
Anti Fouling	2 x 125 microns
Total	500 microns
<i>Hull, topside</i>	
Epoxy	2 x 125 microns
Polyurethane	2 x 50 microns
Total	350 microns
<i>Hull, deck</i>	
Epoxy	2 x 125 microns
Total	250 microns
<i>Superstructure etc.</i>	
Epoxy	2 x 100 microns
Polyurethane	1 x 50 microns
Total	250 microns

4. Paint Specification, Internal

<i>Area</i>	<i>Dry Film Thickness</i>
<i>Funnel</i>	
Anti Flame	1 x 100 microns
Acryl Enamel	2 x 40 microns
Total	180 microns

Internal Accommodation Space, Engine Room, Bow Thruster Room, Steering Gear Compartment, etc.

Alkyd Primer	1 x 80 microns
Alkyd Enamel	2 x 50 microns
Total	180 microns

Fresh Water Tanks

Epoxy (suitable for drinking water)	2 x 125 microns
Total	250 microns

Water Ballast/Drill Water Tanks, Chain Lockers, etc.

Epoxy	2 x 125 microns
Total	250 microns

5. Protection

Cathodic Protection

Sacrificial anodes according to a recognized system are to be fitted for external protection of hull, rudders, seachests, thrusters and propellers against galvanic corrosion.

Design lifetime: three years (minimum)

6. Vessel's Name

Vessel's Name and port of registration are to be made of steel plate continuous welding to the hull and painted.

IMO number to be marked in a conspicuous place of the vessel.

7. Draft Mark

According to the rules of the Classification Society, the mark is to be welded to hull and painted white.

Draft Marks are to be in Roman numerals at both sides with a distance of 10cm and to be provided at midship, forward and aft. The Draft Marks are to be accurately located and to be marked by continuous welding.

8. Name Plates

Identification labels of brass with black engraved lettering, are to be arranged at all valves, sounding pipes, access hatches, outside doors, machinery, pumps, etc.

Identification labels of white plastic with black engraved lettering are to be provided beyond all inside doors as well as at control devices and electrical equipment. Name Plates and signboards are to be in English Language.

Indication instructions and warning lamps are to be provided as per general practice.

9. Coloured Identification

All piping is to be painted white and marked with the following colour codes in compliance with international practice and as follows:-

(i)	Bilge & Ballast	:	Black & Green respectively
(ii)	Firemain	:	Bright Red
(iii)	F.W. System Cold	:	Blue
	Hot	:	Blue with Red Band
(iv)	Fuel Oil	:	Brown
(v)	Lub Oil	:	Yellow
(vi)	Hydraulic Oil	:	Purple
(vii)	Sea Suction	:	Green
(viii)	Sea Water Cooling	:	Light Green
(ix)	Compressed Air	:	Grey
(xi)	Cargo Fuel	:	Owners to specify

Galvanized pipes are to be etched-primed and then top-coated with colour codes.

10. Labelling of Piping Systems

Identification labels at all valves, pipes, machinery, pumps, etc. are to be according to necessity with English Language.

On deck and in engine room labels are to be secured with stainless steel screws or strong adhesive

Chapter XIV

Tests and Trial

1. General :

Tests and trials are to be conducted in accordance with the requirements of the ABS and other regulatory bodies and the marine practice.

The Builders are to submit to the Owner and/or regulatory bodies the detailed schedule or memorandum for the test items mentioned hereinafter in due time prior to those tests according to the Contract.

The Owner's Representative is to attend the inspections and tests as necessary if the Owner's Representative is unable to attend, such inspections and tests are to be performed in the presence of the Builder's QA Inspector and/or ABS's Surveyor, as required. The Builder is to consider the inspections and tests completed and the results are to be submitted to and accepted by the Owner's Representative upon satisfaction of the attending party or parties.

In the event of defects or omissions for which the Builder is liable under provisions of the Contract being revealed by such tests or trials, the Builder is to be obliged to remedy same and if necessary, new tests or trials are to be carried out at the Builder's expense to establish that the Vessel or equipment, machinery has been completed in conformity with the contract.

Model testing of lines plan, to be carried out at a mutually agreed place. Cost implications if any to be resolved between the owner and the builder.

However, the builder confirms that performance criteria stated in this specification shall be met without undertaking any model testing.

Prediction of sea keeping ability to be predicted accurately for sea state 5 by the builder and submitted for owners review on finalization of hull form by an accredited agency.

2. **Shop Test :**

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

3. **Construction Test and Onboard Test :**

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

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

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

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

They are also to determine the extent to which the Owner's Representative shall accept tests or inspections on the basis of the Builder's subsequent reports the tests without his attendance on the tests.

After the main engine, auxiliary machinery and electrical equipment are installed on board the Vessel and necessary piping and wiring are fitted, these machinery is to be put through dock trials prior to sea trials to confirm their satisfactory running.

4. Sea Trial :

Upon completion, except for minor items of work, which may be left unfinished until the trials are over, the Vessel is to be subjected to the sea trial described below.

The sea trial is to be carried out by and at the expense of the Builder who is to provide necessary materials and services for the operation of the Vessel, during the sea trial and the Vessel's trips to and from the Builder's Builder.

5. Preliminary Sea Trial :

Prior to official sea trial, a preliminary sea trial is to be carried out to check beforehand that main engine and auxiliaries are capable satisfactory running at the official sea trial.

The preliminary sea trial is to be conducted by the Builder's side only and according to the Builder's usual practice under suitable draft and schedule.

6. Official Sea Trial :

The Official Sea Trial is to be carried out in accordance with the sea trial protocol schedule submitted by the Builder and approved by the Owner and the final report to be submitted in duplicate.

The Official Sea Trial is to be carried out at weather conditions not exceeding force 2 Beaufort Scale, in deep water, with clean hull and at ballast condition.

The trial is to be inclusive of the following:-

(a) Progressive Speed Test

The progressive speed test is to be executed under the following machinery load, on the measured course by post-sighting method or using electrical instrument.

Main engine load : 75% load of maximum output – one (1) double run
 : 90% load of maximum output – one (1) double run
 : Maximum output – three (3) double run

The main engine load is to be determined by fuel rack and scavenging air pressure based on the figures recorded at shop test or as recommended by manufacturer. Record on fuel oil consumption at designated loads is to be submitted to Owner.

(b) Endurance Test

The endurance test is to be carried out under the following conditions:-

Main engine load : Maximum output (uninterrupted)
 Duration : 4 hours

Fuel consumption of main engine is to be measured for reference during the endurance test.

The time required for progressive speed test at maximum output is to be included in the above mentioned time for endurance test.

(c) Manoeuvring Test

Following tests are to be carried out to check the maneuvering of the Vessel:-

- (a) Crash stop astern and ahead test
- (b) Turning test with helm angle of not less than 35 degrees port and starboard (diameter of turning circle to be measured)

Main engine load:-

Crash stop astern test From ahead, maximum output

Crash stop ahead test From astern, about 80% of maximum output

Turning test At ahead, Maximum Continuous Rating

Time and distance are to be recorded.

(d) Remote Control Test

The performance of remote control for propulsion plant is to be tested.

(e) Other Tests at Sea

The following tests are to be conducted according to the agreed testing and commissioning protocol at a proper time during the sea trial or in port, on a suitable trim and displacement:-

(i) Steering Test

To be performed at maximum output of main engine by steering control from the wheelhouse.

Maneuvering time to bring the rudder from:-

Midship to 35 degree starboard

35 degree starboard to 35 degree port

35 degree port to 35 degree starboard

35 degree starboard to midship

Time taken for the above trials shall meet ABS requirements for the supply Vessel notation.

(ii) Anchor Test

Each anchor is lowered up to five shackles of chain cable under control of hand brake and hoisted by windlass.

Hoisting speed, electric current are to be measured.

(iii) Gyro/Autopilot test

(iv) Adjustment of gyro and magnetic compasses

(v) Tests or adjustment of other electrical navigation equipment and instruments

(vi) Functioning test of bow thruster

(vii) Functioning test of fire fighting equipment

7. **Light Weight Measurement :**

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

The draft of the Vessel is to be measured at both sides of stem, stern draft marks.

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

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

The calculations of the light weight and deadweight are to be made by the Builder and verified by the Owner and then "light weight" and "deadweight" are to be determined.

8. Inclining Test :

The inclining test is to be carried out, after the light weight measurement, in the presence of the Owner or the person authorized by the Owner and the ABS's Surveyor, and then the position of the centre of gravity of the Vessel in light condition is to be determined by the Builder's calculation based on the test results.

The inclining test is to be conducted by shifting weight and by appropriate means. The test may be carried out in the Builder's Dock, or in sheltered water near the Builder's Builder.

Chapter XV

CLOSING REMARKS

Every effort is made to cover the major technical aspects for construction of workboat-cum-Supply vessel(s) duly accounting for relevant builder practice, ABS Rules, Flag State Requirements and last but not the least the requirements of Owners.

The vessel is to be designed and built to best ship-building practice as prevailing in this part of the world and every effort is to be made by all concerned so that the vessel(s) are delivered within stipulated delivery schedule maintaining the high standard of workmanship thereby satisfying expectation of the Owners.

Anything mentioned twice for the sake of clarification or otherwise is to be supplied only once.

Make of most of the machinery and equipments are finalized after going through details of various suppliers offer