

TECHNICAL SPECIFICATION

MULTIPURPOSE BOAT

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Rev 10

Table of Contents

1.	Intent	4
2.	General Description.....	4
3.	Principal Dimensions	5
4.	Classification & Regulations	5
5.	Approval.....	6
6.	Capacities	6
7.	Operating Conditions	6
8.	Power and Speed	7
9.	Stability	7
10.	Noise.....	7
10.1	Vibration requirements.....	8
11.	Materials and Workmanship	8
12.	Construction.....	8
13.	Compartments.....	9
13.1	Fore Peak	9
13.2	Engine Room.....	9
13.3	Wheel house.....	10
13.4	Tank Storage	12
13.5	Aft Compartment / Steering gear compartment.....	12
14.	Outfit and Equipment.....	12
14.1	Hatches.....	12
14.2	Doors.....	13
14.3	Windows	13
14.4	Mast	13
14.5	Railing.....	14
14.6	Fenders.....	14
14.7	Ladders.....	14
14.8	Safety Equipment	14
14.9	Mooring, Outfit and Anchor.....	15
15.	Miscellaneous Outfit.....	16
16.	Insulation, Sound and Heat	16
17.	Fire Fighting	16
18.	Ventilation and Air Condition.....	17
19.	Painting	17
20.	Cathode Protection.....	18
21.	Marking and Identification.....	18
22.	Power Plant (Propulsion).....	19
23.	Propellers.....	22
24.	Propeller Shafts.....	23
25.	Controls of Engine and Gearbox.....	23
26.	Rudder and Steering Equipment	23
27.	Fuel Tanks and Fuel Lines	25
28.	Bilge System.....	26
28.1.	Bilge Pumps	26
28.2.	Arrangement of Bilge Drainage System	26
29.	Wash down system.....	27
30.	Electric System	27
	Cables and wires	27
	Switchboards and Circuit Breakers	28
	Switches	29
	Electrical Equipment.....	30

Batteries	33
Miscellaneous	34
31. Drawings	34
32. Spare Parts	37
33. Trials and Acceptance Tests	38
34. Supervision	38
35. Progress Reports	39
36. Delivery & Final Acceptance	39
37. Makers List	40

1. Intent

The purpose of this Technical Specification is to define the basic design requirements for a multipurpose boat to serve EAPC - Port of Ashkelon, in open sea (coastal areas) , with winds up to Beaufort 5 and significant wave height up to 3 meters, as operation condition.

The Bidders / Shipyards (herein called “Builder”) are to offer a proven design of such a boat and a full building specification to Europe Asia Pipe Company (EAPC), Israel, (herein called “Owner”).

It is not the intent of this Specification to specify every detail that may be required by Owner to make a completely finished and workable Boat.

The Builder, at no additional cost to the Owner, shall supply any errors or omissions in these Specifications, which may be detrimental to the safe operation of the Boat, or are not to the satisfaction of the Israeli MOT and/or Classification Society.

All correspondence plans and documents under these Specifications to be in English.

All labels will be in English.

All units of measurements for this Boat will be in metric units.

The Owner holds the right to supervise in all times the building/outfitting/preparation of the boat to be supplied, by his representatives or other nominated by him.

2. General Description

The boat's will be made of shipbuilding marine steel construction to meet Lloyd's Register scantling requirements (Other classification society shall be presented and approved by EAPC). The wheelhouse will be constructed with marine Aluminum alloys.

The boat intend for mooring operations, pilot operations, “light” towing operations and other offshore operations.

The wheelhouse shall be located fwd part of main deck. Aft working deck shall be provided with minimum of 15 m² free working area.

Aft deck will be strength to load 2 tons/m² – for anchor handling operations.

Towing bit/H frame shall be located in the fwd part of the aft deck.

The wheelhouse will be resiliently mounted to comply with noise requirements and shall have large windows with all round vision. Shape of wheelhouse and the surrounding railings will prevent contact with ships – in all rolling/heeling possibilities of the boat.

Walkways with width of at least 60cm will be provided Ps and Stb the wheelhouse to pass from bow to stern in main deck.

Air draft of the boat shall be as low as possible (max 3.9m), to provide capabilities to work under low piers/bridges and offshore rigs.

The hull will be divided into at least 4 compartments by watertight bulkheads. (If due to stability issues the compartments numbers will be different – it shall be presented for EAPC approvals)

The boat will be propelled by two marine engines, each driving fixed pitch propellers. The propellers will be protected to avoid rope damages . Rudders flaps shall be installed astern each propeller.

Seating arrangement for helmsman and twelve (12) passengers will be provided.

3. Principal Dimensions

Length O.A: Up to 16.00 m.(excluding fenders)

Beam (moulded): abt. 5.0 – 5.60 m

Draft (Navigational): abt. 1.5 m

*Max Air draft height Up to 3.9m

* Air draft will be measured between WL to top of wheelhouse while the mast is in folded (Laying horizontally on top of wheelhouse) position

4. Classification & Regulations

The vessel will be designed and constructed in accordance with Lloyd's Register Rules for Special Service Craft, "+100 A1 +LMC, Pilot & SPECIAL PURPOSE BOAT".

Other IACS calcification society shall be provided to EAPC approvals

The boat should also conform to the IMOT regulations and will satisfy MCA (UK Maritime & Coastguard Agency) requirements for Pilot and work boats.

5. Approval

The Owner or its representatives shall approve all main boat drawings, in order to check conformity to the Specifications and Contract.

All plans, data sheets, specifications, manuals, reports and records shall be in English.

Drawings shall be mailed to the Builders with comments and/or approval by E-mail or facsimile within two weeks from the date on which they arrive at the Owner.

Drawings shall be delivered in due course. Owner shall be responsible to submit to the Builder the list of all plans and documents requested by IMOT. Builder shall act according to IMOT remarks or requirements.

CDR (Critical design review) if applicable - shall be carried out in the Builder facilities. All relevant documentation shall be send to the owner 3 weeks before the CDR scheduled date.

All purchased equipment, including machinery, shall be subject to Owner's approval prior to purchase.

Any substitution or change to equivalent equipment- must get Owner's confirmation and approval.

6. Capacities

Two (2) structural fuel tanks will be provided with sufficient fuel capacity to operate without refueling for at least 20 (twenty) hours at the cruising speed of about 12 Knots, with 10% spare.

Fresh water for deck washing to be provided – tank capacity about 500 liters.

7. Operating Conditions

Boat's machinery and equipment to be designed for running under the following conditions:

- Ambient temperature 45° C
- Sea water temperature max 35° C, min 11° C - specific gravity 1.025 t/m³
- Relative humidity 70%

8. Power and Speed

The boat shall have sufficient power to attain maximum service speed of 23 Knots, fully loaded, under fair weather conditions, calm seas and light wind up to Beaufort 2.

The boat shall be designed to fulfill a semi planning craft requirements. The boat shall be in full planning condition (fully loaded) in speed of maximum 12 Knots up to the max speed.

9. Stability

The boat to be stable and safe under all operating conditions and to comply with IMOT regulations for stability and safety as far as applicable for this size of boat.

Watertight bulkheads to be so spaced as to enable the vessel to remain afloat with positive stability with any one compartment flooded.

Preliminary stability calculation shall be submitted prior to commencing construction.

Prior to delivery, an inclining experiment and light weight measurements will be carried out, and the KG and GM values will be recorded in a proper booklet.

Stability Booklet is to be approved by IMOT.

10. Noise

The maximum noise level when the engines are running 85% of the Maximum Continuous Rating, and AC units are in operation in “low” fan speed - will not exceed:

- 63 dB(A) at the navigating position in the wheelhouse.
- 110 dB(A) at the engine room.

Main equipment switching list during the noise test shall be discussed and approved by the owner at the CDR phase.

10.1 Vibration requirements

The vibration test shall be carried out during sea trials on the similar conditions that exposed on the noise test according to ISO standard 6954-2000.

Measured values of vibration, the acceleration rates in cm/sec² are below the listed limits in frequency range between 2 to 80 Hz.

Location	Vertical	Horizontal
wheelhouse	40	20
Machinery spaces	200	100

11. Materials and Workmanship

All materials will be new, of first class marine quality and fire proof.

Shipbuilding Grade A steel (IACS certified) to be used for hull construction

Aluminum used in construction will be corrosion resistant.

Stainless steel used in the boat is to be of 316L.

Glass to be of Laminate safety glass or equivalent quality.

Marine brass for name plates or hard plastic where applicable.

Wood to be durable hardwood (Teak wood), well-seasoned, of marine approved by Class quality, and well preserved. No chipboard to be used.

Insulation to be of fireproof quality. .

The workmanship of the hull and fittings throughout shall be of good marine practice.

12. Construction

The hull will be constructed of shipbuilding steel grade A , and wheelhouse will be constructed of aluminum 5083 alloy (Or similar approved by the owner) , in compliance with the requirements of Class.

All scantlings and structural dimensions will be approved by Lloyd's Register.

The hull shall be designed to have Semi- displacement round bilge mono hull.

The wheelhouse will be resiliently mounted on deck.

Wheelhouse location should allow for free passage (not less than 600 mm) from both sides of the deck.

The deck plate in way of hatch coaming to be well rounded and compensated for. In way of bollards and lifting eyes, deck will be strengthened by inserted plates and reinforced under.

The stem to be specially reinforced to avoid buckling of plates when approaches pier or ship.

Efficient spray rails to be provided.

A rope-cutting device will be installed.

The engines shall be installed on shock absorbers to avoid vibrations.

13. Compartments

The boat's hull will be divided into watertight compartments.

Indicating audio & video' if doors/watertight hatches are not closed should give alarm.

13.1 Fore Peak

The fore peak will serve as watertight buoyant compartment. Access from main deck to store the anchor

13.2 Engine Room

Engine compartment will be spacious to enable simple access to perform repairs, maintenance and easy removal of engines.

The compartment should be acoustic and thermal isolated to prevent radiation and to minimize noise to the required level. Insulation to consist of fire proof material and to be lined around frames to avoid noise bridging. Lining to be of perforated St. St. plate or sheet of approved type.

Access to Engine Room through aft/ forward doors in W.T. bulkheads and/or through W.T. hatch located on top of raised deck, to comply with safety regulations.

The top of the E.R. floor to be placed as low as possible and will be of aluminum tear plate (antislip) in small panels for easy removal, and bolted down with brass screws. Openings in floor for access to valves, bilge suction, etc., name plates to be screwed on floor plates. Valve handles above plates.

Engines to be removed easy through bolted down hatch on top of raised hatch.

With out shift engines to center line fwd or aft.

The deck over the Engine Room will be elevated so as to enable a free standing

Hand grips and handrails of marine aluminum or St. St. where necessary.

13.3 Wheel house

Wheelhouse to be totally enclosed with access through hinged watertight door with window on the aft bulkhead.

The wheelhouse ceiling, walls and floor are to be insulated with adequate thermal/acoustic materials, complying with IMOT requirements.

The wheelhouse will be fully air-conditioned.(Marine commercial Split unit AC system)

The wheelhouse should have panoramic all round vision and to contain all the controls, instruments and alarms necessary to operate the boat including:

Engine control panel & audio/visual alarm will be installed to control oil pressure, cooling water temperature, engine tachometers, batteries charge ampere meter and additional instruments needed to effectively control the propulsion system.

Steering wheel hydraulic – and stick control for backup

Throttle on the right of the helmsman

Alarm panel with at least 10 alarm points for engine / gearbox / ship alarms and spares.

Fuel meters

VHF with DSC

PA system.

AIS

Radar

GPS

Echo sounder

Window wipers

Navigation light panel
Engine hour meters
Compass magnetic
Signal horn
Search light operated by joystick.2000 yard with wide and narrow beam capabilities.
Loud hailer
Fire extinguisher
Radio receiver with loudspeakers
Clock
Adjustable map light
Fire alarm and indication system
Watertight doors and hatches indication panel
Navigation chart plotter
Console fan shall be installed – for cooling internal part
Safety plan.

Any other equipment gauges or instruments as are necessary for safe operation of this type of boat.

Instrument panels arranged in an ergonomic way to have good visibility angles and ease of operation by the helmsman.

Alarm panel equipped with light and dimmer.

A separate 24V switchboard will be installed containing main switch circuit breakers, switches for navigation lights lighting and searchlight.

Two comfortable (with shock mitigation system) pilot type chairs shall be installed on adequate foundations. Hydraulic damping and adjusting for helmsman and pilot, with foot rests.

Additional upholstered benches for 11 passengers seating, on Port and Starboard.

Benches, top lift, and provided with lockers under for storage of life jackets and any other equipment.

Sound and heat insulation shall be provided.

Lining throughout will be fire proof.

Lining panels will be plastified coated, with insulation material between walls and paneling. Panels will be easily dismantled.

Ceiling white, below windows of teak imitation.

Railing for holding, will be fitted on the ceiling and connected to the structure, one on Port and one on Starboard.

Wheel house floor covered with non-slip 3 mm. rubber mat.

13.4 Tank Storage

The tanks will be situated in the suitable space.

Access to compartment through engine room

Filling from deck with filters. vent pipes with flame arrestor (for fuel tanks) to open air. Bilge drain to be foreseen. Gauges to be side mounted for ease in maintenance.

13.5. Aft Compartment / Steering gear compartment

Access to compartment through W.T. forward door and/or through a hatch with vertical ladder enabling access to rudder stocks and steering mechanism. Natural ventilation to the tank storage and aft compartment. Drain to be foreseen.

14. Outfit and Equipment

14.1 Hatches

One bolted W.T. access hatch will be provided on raised deck above the Engine Room, for engine maintenance and/or removal of engine parts.

The hatch clear opening should be greater by 300 mm than engine length and width to enable easy removal of the engines.

The hatch is to be secured by stainless steel butterfly bolts. Hatch edge to have a coaming and a channel with rubber packing.

Sunk in lifting eyes to be provided.

Two hatches will be provided one fwd. and one aft to serve as ventilation openings during maintenance and as entrance and escape hatches.

Safety holding arms in open position.

All fitting to be maintenance free and easy to operate.

Entrance ladders are to be installed.

14.2 Doors

Aluminum/Steel door for access to wheelhouse with window will be provided in the aft bulkhead.

Door size abt.700 x 1700 mm, sill abt.150 mm.

All opening covers and doors will be closed by dogs.

14.3 Windows

Windows will be provided all around the wheelhouse.

Pilot boarding activities should be visible from the helmsman's position. Visibility should be adequate in both the vertical and horizontal planes.

Unobstructed sight of view above horizontal water plane from the helmsman's position should be ensured.

Large forward windows, with refraction angle towards inside, will be installed.

Frame profiles between windows to be as narrow as possible so as not interfere with the visibility.

On port side and starboard two windows will be sliding “half opening” type (aft part only).

Two windows on the aft bulkhead of the wheelhouse will be provided.

The windows should be of Laminate safety glass of at least 8 mm. thick.

The forward windows to be provided with electrically operated, large wipers, heavy-duty, with water spray.

De-misting heaters will be provided.(to FWD windows).

Operation of the spray water will be by push-button activating water supply pump, from a plastic water storage container. Filling & overflow from and to open deck.

Spray tube and pipes to be of St. St.

Rolling up curtains shall be installed at each window.

Optional : On top of the wheelhouse, window with anti-glare glass to be installed in order to enable the helmsman to see up to 70° from the horizon.

Material of all windows frames to be of St. St. or marine aluminum alloy.

Blind rollers to be installed for protection from sun rays when is berthed.

14.4 Mast

As general – all lights and antennas and other fitting shall be equipped on the wheelhouse structure and not on the foldable mast (Since in harbor operation – this mast will be in lower foldable position).

Aluminum mast, as short and low as possible, foldable, shall be designed to carry the special navigation lights required by authorities for sea going condition . Gaffs and halyards to be fitted.

Flag pole to be part of mast or separately erected.

Antenna whip will be fitted on top of Monkey Island

Yellow flashing lamp on top of wheelhouse and siren in case of bilge/fire alarm - on top of Monkey Island.

14.5 Railing

Holding railing under ceiling in the wheelhouse and in the Engine Room.

Outside hand railing/hands grips will be provided all around the wheelhouse (height 90- 110cm) – attached to WH structure).

Height of railing shall be below windows.

Railing at fore deck around the hatch will be provided.

All railing shall be of St. St. 316L (or equivalent) tubes, with St. St. stays and fittings.

Aft deck will be bounded by steel Bulwark – to provide capability for mooring and light towing operations.

Monkey Island shall be protected with low railing.

14.6 Fenders

The boat will be protected by marine rubber fenders **all around**.

Soft cylindrical and D type fenders to be used to minimize the shocks while approaching ships.

14.7 Ladders

Ladders leading to Engine Room, steering compartment and to tank space from openings in deck to be of marine aluminum/steel.

Transom ladder shall be mounted in recess aft with grab rails.

Aluminum ladder to be installed in convenient location for safe climbing from main deck to the monkey island.

14.8 Safety Equipment

All life saving equipment shall comply with IMOT requirements and be approved by.

- 1 life raft (rigid) according to the number of authorized persons- Pending class approvals
- 14 Life Jackets equipped with whistle, light or light stick- **Owner supply**
- 2 Life Buoys with automatic light and 20 m of rope each- **Owner supply**
- 1 First Aid Kit according to regulation- **Owner supply**
- 1 Set of Pyrotechnics (6 red hand held torches, 2 floating smoke candles, 4 red parachute flares). To be stored and locked below benches, key in a glass box.
- 1 Water tight torchlight with spare batteries
- 1 Set of emergency day marks (anchoring, not under control, etc.)
- 1 Set of code flags
- 1 Post for flags on top bridge aft
- 1 Stainless steel signaling mirror
- 1 Ladder “Man Overboard”
- Emergency recovery hoist at transom
- Fire extinguishers according to IMOT
- A binocular 7x50 to be supplied- **Owner supply.**

14.9 Mooring, Outfit and Anchor

- One (1) aluminum anchor with 10 m. chain and 50 m. polypropylene rope (total length 60 m).
- Anchor sizes according to regulations.
- 24v electrical operated windlass.
- Anchor will be stored at the fore deck. Rope will be stored in fore peak.
- Four (4) synthetic mooring ropes 20 m. each, 30 mm. circumference.
- Strong steel. bollards for mooring to be fitted two fore and two aft.
- One (1) bow fairlead.
- One (1) Aft H – frame or towing bit to be installed in the aft deck , the SWL shall be the maximum BP of the boat – in any case not less than 3 metric tons
- Chocks, as necessary.

15. Miscellaneous Outfit

Optional : One sling assembly for lifting the boat out of the water, complete, with shackles and St. St. wire rope.

Pad bands for lifting.

Four (4) lifting eyes will be provided- please note the structure section.

Optional: One (1) steel cradle for boat storage will be provided (Special attention shall provided to avoid damage to the boat hull and equipments during transportation).

16. Insulation, Sound and Heat

Insulation shall be carried as far as possible in order to minimize noise. Insulation works will comply with noise requirements and with most modern practice for this type of boat.

Generally, the insulation will be in accordance with class rules and requirements, covered by perforated St. St. sheets of 1 mm.

Sound and thermal insulation will be combined as far as practical.

Engine Room shall be totally insulated above water line and insulation to be applied all around profiles.

Insulation of wheelhouse between ceiling and paneling.

Floating floor on shock absorbers shall be fitted in wheelhouse.

Where applicable, the exhaust lines and the engine parts not cooled will be efficiently insulated and covered by means of pillow insulation of approved materials.

17. Fire Fighting

To be approved by IMOT.

Engine Room will be protected with CO₂ system and equipped with fire detection system, remotely released from the wheelhouse.

Means of closure of ventilation dampers to be provided.

Two portable fire extinguishers will be placed in the wheelhouse.

Two portable fire extinguishers will be placed in the store room and Engine Room according to regulations.

Hydraulic quick shut-off fuel valve for emergency stop to be located outside of Engine Room.

18. Ventilation and Air Condition

Two electric fans to be provided for Engine Room ventilation

The capacity of fans shall comply with main engines combustion air requirements, diesel generator consumption , plus an allowance of 20 changes of air per hour in the engine room space.

Galvanized steel air intake trunks with water traps located on the forward coach roof with pipe leading to the bottom of the E.R. and air outlets in the after part of the coach roof. Fire flaps and covers shall be fitted.

Dampers will be foreseen.

The wheelhouse is to be air-conditioned. When plant in operation, the wheelhouse temperature will be maintained at 25° C and 55% R.H. when outside temperature is 36° C and 85% R.H.

The above to be achieved by means of **two A/C split units**, each supplying 100% of cooling capacity. Required capacity will be based for cooling the wheelhouse when seating 12 people, and the radiation of windows and bulkheads.

19. Painting

A plan will be made for the internal and external paint job of the boat, detailing type of paint, number of layers, dry film thickness, application form, color and surface preparation according to proposals by manufacturing firm, and subject to approval by Owner. All paints to be of high quality suitable for marine use.

Preferable paint maker – International.

Surface shall be duly made free from all dust or dirt and prepared properly for good adhesion.

Anti-skid and fire resistant paint shall be applied on the deck and walking sections.

Board remaining above the water level and superstructure will be painted by fireproof paint.

Final coating of underwater hull should be anti-fouling.

The paint will guarantee a protection for 4 years.

Painting specification to be submitted to Owner's approval.

The specification shall include a complete list of items, type of paints, number of coats and DFT thickness (micron/coat).

Painting colors to be as follows:

-Main deck – green (RAL 6001)

- Superstructure – white (RAL 9001)
- Hull – black (RAL 9005)
- Top deck of wheelhouse – orange (RAL 2003)
- Bollards, chocks etc., - black (RAL 9005)

20. Cathode Protection

Sacrificial anodes (Zinc anodes) to be fitted to all materials below waterline and to be calculated for 4 years protection.

All underwater fittings shall be internally bonded.

Grounding connections should be made with copper insulated cable to which engine, tanks and parts subject to corrosion.

21. Marking and Identification

Boat's name or number and port of registry will be marked by punch and painted on bow and transom, and superstructure.

The boat name with IMOT number shall be painted on both sides of the superstructure.

Nameplates for instruments, pipes, valves or any item that needs to be identified will be engraved in brass plaque or hard plastic and attached to place by screws.

Name plates, marking and identification are to be in English and Hebrew languages.

All pipelines are to be color coded at each flange to show their service.

Welded draught marks to be provided at both sides of the bow and stern.

22. Power Plant (Propulsion)

1) Propulsion engines

The boat will be powered by two marine diesel engines make **CATERPILLAR**, made in USA. Type CAT, C-rating. (C-18c) with E.T (electronic technician) including license and adaptor.

Engine power: **533** BkW (Pending power/resistance report to verify the max speed required)

Engine speed: 2100 RPM

The engines will be in accordance with standard delivery, equipment and specifications.

A single use customer CAT ET (Electronic Technician) will be supplied.

The engines will be installed on shock absorbers suitable for this engine in order to minimize vibrations.

2) Power take-off

The following power take-off to be arranged:

Two alternators of at least 180 Amp, voltage regulator (one per engine)

Two bilge pump (one per engine)- subjected to class approvals

One hydraulic pumps (PTO-driven from one of the engines) to serve power steering

PTO bases to be attached to the engine frame.

3) Accessories

The following accessories to be provided:

Exhaust manifold with flexible fittings. The muffler to be large, of best durable quality, with maximum damping noise. Location and fittings for easy removal.

The engine mounted fuel lines to be double wall to meet unattended engine and the required fuel line protection.

Fuel filters, coarse filter and fine filter with clog indicator in visible place. The fine filter shall be duplex type - With two filter chambers connected with a changeover valve one chamber is always in operation while a clean filter chamber is in standby mode. The coarse filters to be provided with water traps and alarm.

Air filter, dry type, with clog indicator, also to act as air silencer.

Quick shut-off valve for fuel for emergency stops (IMOT requirement).

4) Gearboxes

Reverse reduction gearboxes to be engine mounted and of good marine quality.

Gearbox - Make: **MG-TWIN DISC** type MG 5114 A- or equivalent

Gearboxes shall be connected to the main engines via a flexible coupling (VULKAN or equivalent).

Gearbox reduction ratio to be advised by propeller manufacturer/designer.

5) Gauges and Instrument panel

The helm control console shall be fitted with a comprehensive engine monitoring instrument package from CATERPILLAR. (Pilot house instrument panel EMS).

Gauges and Instrument panel on the Bridge will include:

Tachometer + Hour Meter (The Hour Meter activated only when oil pressure available).

Water temperature gauge

Pyrometer for exhaust temperature

Fuel oil pressure meter

Oil pressure gauge - engine

Oil pressure gauge - gearbox

Start/Stop switch

Light dimmer for all meters

Ampermeter and battery charge meter

Rudder indicator

Alarm panel to include:

Charging alternators

Oil pressure - low

Temperature jacket water - high

Level alarm hydraulic - low

Jacket water level in expansion tank - low

Oil gear temperature - high

Oil engine temperature - high

Bilge water level – high

Seawater flow alarm

3 Spare alarm points.

Soft touch buttons, not self-holding, to be provided for cancellation of oil alarms.

PLC programmable controllers shall be provided together with an alarm operating panel.

Alarms to be visual and audible at the same time.

Acknowledgment of audible alarm to be separated from visual alarm.

The alarms in engine room to be individually displayed on panel installed on control desk.

A group alarm for each engine line to be provided in the wheelhouse console.

Alarm indication on panel to be as follows:

Flashing light for incoming alarm

Steady light for acknowledged alarm

No signal for disappearance of alarm condition after acknowledgment.

Warning horn combined with above alarms.

Independent bilge alarm shall be connected to mast top with flashing light and audible alarm.

All gauges to be graded and colored green, yellow and red.

Pressostats on engines and gears to be maker's standard sealed type.

6) Spare parts

Spare parts and tools as supplied by engine manufacture. Manufacturer spare parts recommendations shall be delivered to owner review.

7) Cooling System

Sea water cooling system shall be based on direct suction from sea chest/intake valve – using heat exchangers.

Optional: Keel cooling system. Owner will decide the preferable solution before purchasing contract signing.

Sea water Filters to have clear removable top so as to enable inspection.

Valves should be Globe valves.

The system shall be adequate for tropical working conditions, sea water temperature 35° C.

Each engine/generator is provided with a closed cooling system, which circulates fresh cooling water, expansion tank. The expansion tank to have a gauge glass and low level alarm.

Each cooling water pump is driven by its respective engine.

The cooling water pipes to be connected to the engines via flexible couplings.

De aeration plugs to be mounted at suitable points in the cooling water system.

8) Exhaust System

The two main engines exhaust pipes to be ducted through aft shells of the E.R (Through the aft side shells of the boat- recess outlets). Direction of shell penetration shall be 45 degrees down.

Exhaust lines to transom shall be of seamless **Preferable** Stainless Steel SMO 254 with St. St. Flanges.

Using corrosive free St. St. expansion bellows shall do the connection of the exhaust lines to the engines.

Exhaust to comply with safety regulations for boats serving oil ports (silencer with spark arrestor).

Exhaust silencers of adequate capacity, will be fitted at a suitable position in the exhaust lines. Care shall be taken to prevent entry of water into the engines.

Silencers and exhaust pipes shall be insulated with proper thermal insulating materials.

Aft part of the exhaust lines will be injected by sea water to provide “wet” exhaust discharges.

23. Propellers

Diameter and pitch of the propellers will be designed as to meet the rating of the engines and the required speed, and to be cavitations free.

Propeller material to be of special light alloy corrosion resistant.

Propellers are to be balanced, keyed and tapered bored, secured on shaft with tapered nut (cap) and securing bolt on this nut.

Propellers shall be protected to avoid ropes damages

One set of spare propellers will be supplied with the boat.

24. Propeller Shafts

The propeller shafts will be of high quality tensile stainless steel as per Class approval.

Diameter of the shafts to be sufficient for maximum rating of the engines, according to Class requirements +5%. End cones to be equal.

For repairs, stern shaft is to be drawn outboard.

Flexible gland-type sealing forward in hull, fitted with special strong hose to tube and provided with hand operated easy accessible grease press.

Water supply to bearings from outside (.if necessary)

One set of spare propeller shafts to be supplied with the boat.

25. Controls of Engine and Gearbox

Twin Disc totally electronic Power Commander with CATERPILLAR multi station control system to be provided.

26. Rudder and Steering Equipment

Rudders

Special attention will be given to the rudders, not only for good maneuverability, but also to their protection and easy dismantling.

Rudders area will be as large as permitted to enable the boat to have a minimum turning circle.

Balance-double plates type rudder with:

- Rudder blades – approved by Class.
- Rudder stock welded to the rudder blade.
- Rudder tubes bonded into hull.

- Cutless lower and upper bearing in the shaft tubes, provided with accessible hand operated grease-press.
- Watertight sealing on top of the tubes (top to be above waterline).
- Top of tubes to be supported by strong back supported from hull structure.
- Rudders angle limited fittings will be fitted on the above-mentioned support to assure normal maximum rudder turning.
- Emergency operation mode - hand operated from deck to be provided.
- Tillers connected by tie bar.
- Central greasing from one central source to all greasing points.
- The tiller of the emergency steering will be attached to the after part of the cabin.

Steering

Power steering to be hydraulically actuated, of approved type.

PTO hydraulic pump to deliver oil through block safety valve to follow-up steering unit to the power piston actuating the rudders.

Return line connected with by-pass valve and returning to an oil tank and supply line to pump.

The change-over by-pass valve is to be placed in the wheelhouse or close to entrance to steering compartment.

All hydraulic pipes will be seamless of high-pressure steel pipe, approved by Class.

Position of rudder to be read on an electric rudder indicator.

By-pass for emergency hand hydraulic system will be incorporated.

Filling of hydraulic oil to be easy accessible located.

Possibility of steering while the booster pump is out of operation – Manually operation.

27. Fuel Tanks and Fuel Lines

Filling by flush seal type deck fillers with suitable vent pipes, with anti-flame, leading to open deck adjacent to superstructure.

Drain valves to be provided.

Each tank will be provided with an inspection manhole of acceptable size.

Take off point to engines shall be fitted with shut-off valve at the tank and return connection from the engine.

Drain plug to be fitted.

Suitable interconnection and separation by means of valve will be foreseen.

Tanks on sides at top edge shall be fitted with a level gear for installation of an electric fuel capacity gauge.

The indicator shall be positioned in the instrument console.

Further, there will be a glass level indicator, Klinger type, or equivalent.

Fuel level indicators to be easy accessible located.

In the fuel supply line to the engine, an extra water filter made by RACOR will be fitted. Type and capacity suitable for the engines.

The filter shall be positioned at a convenient place in the Engine Room.

Filters to have drain cocks and alarms.

Fuel lines will be of St. St. 316 and fitted with remote shut-off valves operated locally and from the wheelhouse (quick closing valves).

Fuel duplex filter will be fitted after fuel tanks and will have alarm on the wheelhouse panel.

28. Bilge System

28.1. Bilge Pumps

To be installed in the following locations:

- One bilge pump, in each engine make “JABSCO”, driven by main engine, to be electric clutch operated by push button near entrance to E.R. and wheelhouse. with automatic stop.

Control operating light to be provided.

- Electric (24V) driven pumps for draining the lowest point in each compartment, automatically operated by a floating switch and parallel operated by spring push button, near engines. Pumps shall have option to be disconnected in harbor operation .
- One manual operated double acting membrane pump for the Engine Room will be operated from main deck (wheelhouse area).
- All bilge system suction valves shall be globe type.

28.2. Arrangement of Bilge Drainage System

The engine driven pump and the manual operated pump are to be connected to a manifold, with sufficient points to each compartment and with an overboard discharge through the hull (just below the upper fender). Last section to be clear visible pipe.

The suction manifold to be placed at lowest point in the E.R. Manifold shall have connection for sea water suction and the necessary hand operated valves for taking suction from the various compartments.

Limber holes in frames and longitudinals for passage of water shall be provided.

The electrically (24V) driven pump will have its own discharge.

Each compartment shall be provided with two suction points (aft and fwd.) and a strainer in its lowest point.

A bilge level alarm shall be fitted in each compartment.

Bilge alarm should provide an audible and visual warning at the control position in wheelhouse.

Level switches to be installed in each compartment near the bilge suction points.

Name plates near each valve.

Strainers to be easily accessible.

Suction and discharge lines to be well clipped and protected from damage.

The strainers to be of marine approved type, with non-return valves.

Where necessary/applicable, flexible connection is to be made to avoid vibrations in the system.

29. Wash down system

Fresh water wash down system to be provided. 2 house connections to be provided – one in the aft working deck and one for sink attached to the wheelhouse structure.

FW tanks capacity – about 500 liters.

One Hydrophore to be installed – capacity about 5 liter.

Pump shall be 220v ac pump – power to be provided from Generator power. Alternative – 24v driven pump.

Final decision after evaluating the ELA reports .

30. Electric System

The electrical installation and equipment will be tested and delivered in accordance with the LR rules and regulations.

All electric and electronic equipment is to be suitable for continuous duty marine service,

The boat's electrical system to be executed as ungrounded 2 wires, 24V DC system, controlled via two grounding lamps.

Installation will be according to good marine practice and resisting tropical conditions as well.

A converter 24 V DC to 220 AC in the wheelhouse. As well 220 v sockets shall be located in each compartment.

Diesel generator to be installed to provide the power needed for the AC units and to serve the 220 v consumers. Genrator power will have 20% reserve. Preferable maker – Caterpillar.

Cables and wires

All cables and wires of approved marine type and flame retarding to class regulations, and to be secured by clips and mechanically protected where necessary, or laid in PVC tubes. Conductor size shall be according to the rules.

Control cables to have spare conductors according to shipyard practice,

Where exposed to mechanical damage, cables to be suitably protected.

All cables to be labeled by labels with engraved numbers.

Electrical connections to engines via plug-in system.

Switchboards and Circuit Breakers

Switchboards/distribution panels to be of dead front type with closed back and meet classification society requirements.

The equipment installed within the panels to be easily accessible for operation and maintenance.

Doors on switch panels to be hinged and equipped with door stopper and lockable latch and handle,

Switchboards and panels to be coated with corrosion resistant paint.

Paint color to be RAL-7032. (if not St.St.)

All outgoing circuits will be protected by double pole miniature circuit breakers, with thermal magnetic tripping, having adequate characteristic and suitable range.

The switchboard shall contain the following:

- Main switch (To be installed outside of the Box).
- Miniature circuit breakers for the following consumers:
 1. Windshield wipers washers
 2. Signal horn
 3. Searchlight
 4. Navigation lights including towing lights
 5. Pilot lights
 6. Interior bull's-eye lights
 7. VHF
 8. Loudhailer
 9. Rudder angle indicator
 10. Bilge pump
 11. Fire detector
 12. Sockets
 13. Floodlight aft
 14. Compass

15.Spare

16.Spare

Fuses and breakers to be in one switchbox and located in the wheelhouse console, easily maintained and operated by the helmsman.

Circuit breakers shall be clearly marked with nameplates.

The electrical system on the engines shall be protected in the engine's instrument panel, so no further outgoing circuits for the engines shall be in the above mentioned circuit breakers board.

Switches

Minor switches (toggle switches) are to be fitted in the instrument panel of the helmsman's console for operating the following equipment:

- Window wipers/washer: 3 switches (spring type)
- Signal horn: 1 switch (push button)
- Navigation lights: 1 switch
- Search lights: 1 switch
- Wheelhouse lights: 1 switch
- Bulls-eye: 3 switches
- Compass: 1 switch
- Loudhailer: 1 switch
- One additional switch for switching Navigation lights and pilot lights together.

Remote emergency stop switch for all electrical systems, except fire fighting and radio shall be provided.

The Engine Room lights will be operated with a separate switch placed inside at the entrance.

The switches on the instrument panel will be clearly marked with nameplates.

Electrical Equipment

Windshield Wiper/Washer

Heavy duty, wipers will be fitted on the front windows.

Signal Horn

One signal horn, electric operated, range 2 miles.

Searchlight

One (1) sealed beam - 500 Watt, Halogen, to be fitted on wheelhouse top, controllable from inside wheelhouse with joy stick by the helmsman. .

Floodlight

One (1) sealed beam floodlight will be fitted for illumination on the aft deck.

Navigation Lights (Led)

One (1) mast head light

One (1) stern light

One (1) Starboard light

One (1) Port side light.

Navigation lights to be adequately protected.

All lights, "Aqua Signal", or equivalent' will be supplied with Maker's certificate.

Stern light will be positioned aft on the wheelhouse.

Mast, Stern, Port and Starboard lights to be connected by single switch.

All lights should comply with COLREG 72.

Pilot Lights

One (1) all around white light.

One (1) all around red light.

Lights in the Wheelhouse

Four (4) interior lights, deck head lamps positioned equally.

Housing marine brass plated NICR or St. St. 1 chart light flexible.

Bull-eye Lights

Each light with a bulb of 25 watt, without switch on the light.

To be positioned:

6 x engine room (gas tight) 2x18W each.

2 x store room

1 x aft peak

1 x tank room (gas tight)

The lights are to be watertight.

VHF Installation

One VHF ,with DSC, with speaker, handset and built-in loudspeaker. Foot switch for on/off.

AIS

One AIS will be provided.

GPS

One (1) GPS will be provided.

RADAR

One (1) marine radar will be provided

Echo sounder

One (1) echo sounder will be provided.

Talk-back

One (1) talk-back communication system should be provided. One (1) loudspeaker to be installed in aft deck connected to the public address system.

Loudhailer

Marine type, watertight loud hailer on wheelhouse top. Amplifier and speaking point shall be provided in wheelhouse.

Rudder Angle Indicator

Two(2) rudders angle indicators will be fitted in the instrument panel, with lighting.

Two (2) Rudders angle gears will be fitted near rudders stocks and on the rudders arms.

Chart plotter

One chart plotter will be provided. AIS and echo sounder data shall be connected to the CP.

Anchor winch

24v anchor winch to be installed

Entrainment system:

One (1) radio to be provided – based on Bluetooth connections from external devices. Loud speakers in wheelhouse ceiling to be provided.

Fuel Tank Level (Capacity) Gauges

Will be fitted in the instrument panel with lighting - 1 for each tank.

Tank level gear is to be fitted in the tanks.

Bilge Pumps

Electric pump make JABSCO, capacity at least 130-150 liters/min., automatically operated with a floating switch. Additional push button switches to be installed parallel to floating switch in E.R.

Sockets (Power Outlets 10A) – 24v

Positioned:

2 in engine room - (European type)

2 in wheelhouse - (European type)

1 x in aft compartment

1 x in entrance to E.R.

Sockets – 220 v

Positioned:

2 in engine room - (European type)

4 in wheelhouse - (European type)

1 x in aft compartment

1 x in entrance to E.R.

A portable inspection lamp, with 8 m. cable and plug will be supplied with the boat plug finger type.

Compass

Magnetic compass will be fitted in the helmsman's console.

Batteries

Four maintenance free (Gel) batteries, each 24V, 210-260 Ah (**Pending the ELA report**) . will be installed in boxes (two in each box).

The batteries to be marine type, tropical proof, standard size, with handles for lifting.

Connection possibilities between banks, cross and in parallel.

GMDSS equipments shall have separate batteries as required by Solas.

The batteries will be placed in St.St. battery box, positioned Store room, at a suitable location, as will be approved by Owner.

The box will be well ventilated to the outside. (According to LR and IMOT rules)

A battery charger should be provided, to each bank.

Charging of the batteries by the alternators with regulator fitted on the main engine (24V 100 amp.).

Isolating switch for the batteries will be fitted in wheelhouse.

Shore connection should be provided.

Miscellaneous

All electrical equipment and engine alternators to be suppressed to radio interference.

Instruments and Panels in wheelhouse to be easily access either via E.R., or through hinged top lift panels.

31. Drawings

30.1) Drawings submitted together with Contract Specification

The following drawings (4 of each) will be provided and will constitute part of the contract specification:

1. General Arrangement Plan
2. Main Sections.
3. Engine Room Arrangement.
4. List of Makers and Suppliers.

30.2) Drawings for Owner's approval

The following drawings (4 of each) will have to be approved by Owner:

Hull construction drawings

1. Lines Plan
2. Preliminary stability calculation

3. Tank plan
4. Main sections
5. Decks
6. Shell expansion
7. Longitudinal sections
8. Wheel house
9. Engine foundation
10. Welding table
11. Deck outfit arrangement
12. Mast, navigation lights and W/H roof arrangement
13. Doors and hatches
14. Windows
15. Bottom penetrations
16. Air/sounding pipes
17. Railing
18. Cathodic protection
19. Fender arrangement
20. Painting plan
21. Wheel house arrangement
22. Helm console and controls
23. Sound and heat insulation
24. Paneling
25. Arrangement of compartments under deck
26. Main engines mounting
27. Propulsion line arrangement
28. Rudder and steering system & diagram
29. Sea water cooling system
30. Fresh water cooling system
31. Coolers
32. Bilge system

33. Fuel system
34. Engine room ventilation
35. Ventilation and air conditioning
36. Fire fighting system
37. Steering hydraulics
38. Exhaust system
39. Man electric diagram 230 VAC.
40. Man electric diagram 24 VDC.
41. Lighting system
42. Lighting weather deck
43. Ventilation electric equipment
44. Fire alarm system
45. Central alarm system
46. Navigation equipment
47. Radio equipment
48. Window wipers
49. Navigation lights
50. Main engine cabling
51. Bilge pumps
52. Electric load analysis
53. Safety plan
54. Harbor trials
55. Sea trials
56. Inclining test
57. Final stability booklet

A detailed list of all drawings and technical documentation, which must be delivered to Owners, shall be prepared by Builder and submitted to Owner's approval.

30.3) Delivery Drawings and Manuals

Upon delivery, the Builder will provide Technical Documentation as described hereunder:

- a) “As fitted” drawings in two sets plus one set of originals.

- b) Two sets of operation and maintenance manuals of all equipment and engine on board and parts catalogues, in English.

The following equipment manuals will be provided:

- Operation manual
- Maintenance manual of all pumps and equipment
- Parts list with catalogue numbers and makers for all equipment.
- Engine operation and maintenance manual
- Engine overhaul manual
- Engine parts catalogue
- Maintenance and repair manual for other repairable components.

32. Spare Parts

The following spares shall be provided with the boat:

A set of spares as per Manufacturer’s recommendation, for three (3) years operation.

The volume of spare parts and tools shall include, but will not be limited to:

- Propeller, shaft, shaft bearings, shaft seals, engine tools, engine spares.
- Diesel generator
- Any special tools provided by makers
- Tools for extracting propeller and for extracting shaft bearing.

33. Trials and Acceptance Tests

Boat final acceptance tests will be carried out in the presence of Owner representatives.

Tests and sea trials will include:

- Speed
- Maneuvering
- Emergency stops
- Endurance test
- Noise level test
- Operational test of all systems, safety & outfit equipment
- Operational test of all alarms
- Inclining test

Above trials will be carried out in accordance with an approved by Owner “Test and Trials Program”.

Speed Trials to be carried out in a calm sea with 6 persons on board and fuel tanks full.

After the trials, the Boat is to be completed, and all outstanding points completed to Owners’ satisfaction.

34. Supervision

In addition to the inspections required by the regulatory and the class bodies specified herein, the boat at all stages of construction, including all outfitting, machinery and equipment may be subjected to the inspection and approval of Owner’s duly authorized representatives.

The Owners will have the right to supervise the construction of the boat at all stages, and to request alterations which they consider to be useful, subject to adjustment of costs, and if necessary, an extension of the delivery time being agreed upon by Owners and Builders.

The Owner’s representatives shall have every authority to inspect and/or supervise materials, design and work, prior to and/or during construction or tests and trials.

The Owner's accredited Surveyors will have the power to reject any defective materials, and/or workmanship that may be defective and/or found not complying with the terms of the Specification.

The Owner representatives shall have access during normal working hours to the sub-contractors facilities in order to inspect all equipment and machinery at and to be present during equipment testing prior to delivery to the Shipyard. Approximate notices of such test shall be given to the Owner at least two weeks in advance stating date/time and place for the test. The Owner representative shall confirm his participant by official mail/letter to the Builder project manager.

Copies of the technical correspondence between the Builders and the Owners and the Builders and IMOT and LR are to be handed to the surveyors.

The Builders will deliver in duplicate the detailed construction schedule in accordance with their normal practice as soon as possible after signing the contract. Once every two weeks itemized progress report and photographs will be delivered by the Builders.

During the stay of the Owner surveyors at the Yard, suitable separate room with the necessary furniture and office equipment shall be made available for their use.

The Builders are to put at the disposal of the Owners' representative the usage of its fax, telephone, E-mail and computer systems (Only dedicated to the time periods that the owner representative will visit the Builder facilities)..

35. Progress Reports

The Builder will complete a once in two weeks progress report and submit his report to the Owner representative.

The report is to include photos at various stages of building.

36. Delivery & Final Acceptance

The Boat shall be delivered to the Owners, in Haifa Port, into a first class seaworthy condition, all the Boat systems in operating condition, and so attested by a suitable Protocol signed by the Builders and the Owners, confirming no damage in transit.

37. Makers List

It is hereby clarify that for each item below, equivalent maker may be submitted, subject to the prior written approval of the Owner, at its sole discretion.

Subject/System	Makers
Paint	International
Fixed firefighting system	Whlhelmsen ships equipment /Unitor
Fire detection system	Concillum, Siemens
Rigid Life raft	Viking or equivalent
Window wipers	Wynn Marine
Air condition system	Daikin Japan
Main Engines	CATERPILLAR USA
Generators set	CATERPILLAR USA
Shaft coupling	Vulcan/Centa
Gearbox	Twin disc
Heat exchanger	ALFA LAVAL
Starting air compressors	Hattlapa or equivalent
Centrifugal pumps	ALLWEILER, DESMI, Jabsco
Piston pumps	Heinrich Behrnens Germany
Engine room fun +Machinery spaces fans	Novenko
Valves	Econosto
Temperature Regulator	AKO Regelusteching GmbH
Manometers	Wika
Thermometers	Sika
Communication equipment	
MF/HF RADIOTELEPHONE,VHF RADIOTELEPHONE,PORTABEL VHF	SAILOR
EPIRB,RADAR TRANSPONDER	KANNAD
NAVTEX	JRC
Navigation equipments	
ECHO SOUNDER	SAILOR
RADAR,ELECT MAPS,GPS,AIS	JRC
International communication system	
SOUND POWER TELPHONES,TALK BACK SYSTEM	AMPLIDAN
Lighting fixtures	Aqua Signal/Galmox