

**ANNEX A**

**TECHNICAL SPECIFICATIONS OF**

**600 TONS MARITIME PATROL VESSELS**

**FOR**

**PAKISTAN MARITIME SECURITY AGENCY**

## **CHAPTER 1- GENERAL DESCRIPTION**

### **1.1 Mission and Areas of Operation**

This Maritime Patrol Vessel (MPV) shall be constructed to have capability to operate independently or as part of a composite force in coastal and deep sea area as per PMSA allocated area of EEZ (240,000 sq Km) stretching 200 NM from coast and operate in SAR area of 840 NM allocated by IMO as far as possible for performing the following major missions:

- (1) Maritime Security Operations (MSO) including Patrolling and Policing.
- (2) Operations against Asymmetric Threats.
- (3) Surveillance of EEZ and fishery protection.
- (4) Pollution Control and Disaster Management (Pollution control equipment (Not to be quoted against IT. Its list along with prices be provided separately to PMSA).
- (5) Disaster Relief and Personnel Evacuation.
- (6) Emergency Medical and Life Support.
- (7) Intelligence gathering.
- (8) Search and Rescue.
- (9) Training.

### **1.2 Rules, Regulations and Codes**

The ship shall be designed, constructed and tests/trials conducted in compliance with relevant Classification Society Rules.

### **1.3 Measurement Unit and Languages**

All standard parts shall be in the metric system.

Volume	= m <sup>3</sup>	Ton	1 t = 1000 kg
Pressure	= kg/cm <sup>2</sup> (bar)	Temperature	= Celsius

The English language shall be used for all plans, booklets, nameplates, caution and identification plates, specifications, manuals, publications, drawings and all other documentations etc.

## **1.4 Definitions**

Normal load: 50 % fuel required for mission length.

Full Load: 100% fuel required for mission length.

Maximum Load: All tanks and stores at 100% capacity.

In case of conflict, the complete definitions related to dimensions, power ratings, speeds, displacements and other characteristics of MPVs are to be adopted as per relevant Classification Society Rules and followed during construction and tests/trials of MPVs.

## CHAPTER 2-MAIN PARTICULARS

### 2.1 Main Characteristics

#### 2.1.1 Ship Type

The ship shall be designed and constructed as semi planning vessel with single continuous deck, raked stem, flaring freeboard, transom stern and round bilge fitted with spray strips and one pair of anti rolling fins. Propelled by four fixed pitch propellers driven by four marine diesel engines and steered by four rudders with a separate helo landing and take-off deck.

#### 2.1.2 Main Dimensions

Length between perpendiculars	≥ 60	m
Draught (maximum)	≤ 3 (less is desirable)	m
Beam Width	≤ 9.0	m

#### 2.1.3 Displacement

- a. The normal load displacement shall be around 600 tons or as appropriate.

#### 2.1.4 Speed

In the condition of Normal load displacement, clean hull (i.e upto 180 days out of dock), deep water (Minimum 10 m) and sea state 3 or below (i.e significant wave height of 1.25m maximum), the speed of the ship shall be as follows:

- a. Max. Speed >27 Knots
- b. Cruising speed >15 Knots

#### 2.1.5 Endurance

The endurance shall be as follows in normal displacement condition:

- a. Not less than 2600 NM at the Cruising speed of 15 -18 knots at normal displacement in sea state 2-3.
- b. Not less than 650 NM at the maximum speed of 27 and above knots at normal displacement in sea state 2-3.

### 2.1.6 Self-Sustaining Capability

The self-sustaining capability of the ship at full load displacement shall be 15 days. In the condition of Max load displacement, the self-sustaining capability of the ship shall be:

- |                               |                         |
|-------------------------------|-------------------------|
| (1) Time away from major base | about.1 Month.          |
| (2) Victual store capacity:   | about 2 months as under |
| (a) Fresh provisions          | 7 Days                  |
| (b) Frozen provisions         | 15 Days                 |
- (3). In addition storage capacity of following dry provision is needed adjacent to fresh and frozen provisions:
- |                       |         |
|-----------------------|---------|
| (a) Dry provisions    | 30 Days |
| (b) Tinned provisions | 15 Days |
- (4). Approximately 1 kg/ person food is needed for each day at sea for crew.
- (5) Store Rooms for stowage of spares / consumables required for approximately 3 months are also to be provided at cruising speed at Normal load displacement.

### 2.1.7 Stability and Seaworthiness

- (1) Stability of the ship shall be as per relevant Classification Society Rules.
- (2). The ship shall navigate safely at full load displacement at sea state 5-6
- (3) The ship shall be able to use weapons and Vertical RAS up to Sea State 4-5 and boat lowering and recovering up to sea state 3-4

### 2.1.8 Maneuverability

- (1) Ships maneuverability characteristics shall be as per relevant classification society rules for coast guard ships or equivalent.
- (2) In the condition of normal displacement, with max speed in full rudder angle, the turning diameter shall be 6~7 times the length of the ship.

### 2.1.9 Floodability

The ship shall remain afloat in various loading conditions when any two adjacent compartments are flooded symmetrically or asymmetrically.

### 2.1.10 Complement

The complement of the ship shall be 55 persons and 5 officers.

## **2.2 Main Capability**

### **2.2.1 Survivability**

#### 2.2.2.1 Hull Strength

The ship's hull strength shall be designed and verified in accordance with relevant classification society rules.

#### 2.2.2.2 Water tightness

The water tight integrity shall be as per relevant Classification Society Rules.

#### 2.2.2.3 Damage Control Capability

a. The ship shall have Damage Control Capability as per relevant Classification Society Rules. There shall be requisite Internal Communication equipment used to conduct Damage Control procedures and subsequently carry out anti-flooding operation simultaneously at various locations, and utilize fire pumps and educators. The bilge/flood alarm system shall also be installed to warn for flooding in Main Engine Rooms and other underwater compartments where accumulation of water may occur.

b. When any two adjacent compartments are damaged and flooded, the pumps shall have capacity to deflood the compartments after necessary damage control procedures.

#### 2.2.2.4 Fire Prevention, Fire Containment and Fire Fighting Capability

a. The Fire integrity of MPV shall meet the requirements as per relevant Classification Society Rules. The MPV shall be divided into separate fire-fighting zones and the main fire proof bulkheads shall be insulated by structure and material to prevent fire/smoke spread. Each fire zone shall be have a separate Damage Control and Repair Locker which shall be equipped with firefighting and damage control equipment, tools and portable infra-red fire detection camera as per relevant rules of classification society.

b. Fire/smoke detection sensors shall be installed throughout the ship and Fire Alarm System shall also be installed. The system must be composed of the "CO2" extinguishing system for the Engine Room, Fire hydrants with

hoses and nozzles and portable emergency fire pump. Each zone shall have adequate fire fighting arrangements. Automatic fire fighting arrangements (sprinkling system) shall be installed for magazines.

**c. Two separate high capacity fire pumps along with fire cannons on each ship' side** be installed for firefighting major fire on other ships in vicinity in the range of 70-80 meters during Search and Rescue operations.

### 2.2.3 Noise Level

The noise level within the ship shall be in accordance with relevant Classification Society Rules.

## **CHAPTER 3-HULL STRUCTURE**

### **3.1 General**

The hull structure design as well as the strength and vibration calculations shall be performed according to relevant Classification Society Rules. On the basis of these standards, the hull structure shall be designed as light in weight, strong in strength and low in vibration. The hull shall be accordingly constructed.

### **3.2 Hull Material**

Marine Mild steel with yield strength not less than 235 N/mm<sup>2</sup> shall be adopted as the main hull material. Marine aluminum alloy shall be used for super structure. All the construction materials including cast-steel and aluminum shall be of good mechanical and fabrication properties and duly approved by respective classification society for construction of MPVs.

### **3.3 Hull Structure**

#### **3.3.1 Deck Structure**

The ship shall be of continuous single deck longitudinally through the whole ship. Beams shall be fitted to the deck with the camber of 1/50 of the ship breadth. The sheer shall be set up to the deck longitudinally.

#### **3.3.2 Fins and Bilge Keel**

A pair of active anti-rolling fins (electro hydraulic operated) shall be fitted near the amidships.

#### **3.3.1 Bottom Structure**

The solid bottom frame shall be fitted to each frame located in the areas of fore and stern part of the ship to withstand hydro dynamic pressure and reducing hull vibrations. The solid bottom frame shall also be set up in every frame of Main Engine Rooms for strengthening. In the rest of the areas, solid bottom frame shall be used in every two-frame spaces for good connection with other frames.

#### **3.3.2 Shell Plate**

The shell plate around the locations of stern propeller, propeller strut, anti-rolling fins, bow hawse pipe, shall be thickened locally.

#### **3.3.3 Landing and Take-off Facility**

Landing and Take-off facility (Flight Deck) shall be provided for Search and Rescue helicopter (Suitable for SAR Helicopter of approx. weight of 5.5

tons).

### **3.4 Workmanship and Inspection**

3.4.1 Hull construction and equipment/ machinery installation is to be inspected by customer and classification society surveyor as per conditions laid down in respective classification society rules.

## **CHAPTER 4-OUTFITTING**

### **4.1 General**

This craft shall be provided with the marine outfitting in accordance with relevant Classification Society Rules.

### **4.2 Anchor System**

This craft shall be provided with 02 X anchors with appropriate accessories and fittings to anchor in sea state 2 and above.

#### **4.2.1 Anchor**

This craft shall be provided with two Anchors (preferably AC-14 or equivalent).

#### **4.2.2 Chain**

Two appropriate stud link welded chains with appropriate length shall be provided and the chain should have swivel piece at the bottom end in cable locker.

#### **4.2.3 Chain Locker**

The chain locker shall be located in the forepeak with enough capacity. The chain pipes shall be provided in the top of the locker for access of the chains.

#### **4.2.4 Hawse Pipe**

The hawse pipe shall be provided with the cover plate on the opening of the deck. The hawse pipe and anchor securing mechanism shall be designed and constructed in a manner that anchor chain does not bang/slam with ship's side plates at sea.

The round steel shall be fitted on the cut-out of the hawse pipe.

#### **4.2.5 Chain Stopper**

Two appropriate chain stoppers shall be provided.

#### **4.2.6 Anchor Abandoner**

Two anchor abandoners shall be fitted at the suitable height on the side bulkhead plate of the chain locker.

#### **4.2.7 Anchor and Cable Strop**

Necessary anchor and chain strops shall be provided.

### 4.3 Towing and Mooring System

#### 4.3.1 Bollards and Fairleads

This craft shall be provided with the bollards and fairleads in accordance with the Classification Society Rules.

#### 4.3.2 Mooring and Towing Ropes

No	Name	Model	QTY	Remarks
1	Mooring ropes	Ø22 BCF Tarm	140m×4	As per classification society standards
2.	Towing ropes	Ø22 steel wire rope	180m×1	As per classification society standards

Table 4-1

### 4.4 Rudder System

#### 4.4.1 Rudder Blade

The craft shall be provided with four streamlined under hung balanced rudders of appropriate size.

#### 4.4.2 Steering Gear

The craft shall be provided one electric hydraulic steering gear, which consists of one pushing mechanism, two independent oil pump electric units, one spare oil tank and one manual emergency steering gear.

It shall be capable of operating four rudders from one side 35 deg to another side 30 deg, within a period of time no more than 28 seconds.

The auto pilot shall also be fitted and integrated with ship's steering system.

### 4.5 RHIB and Boat Handling Equipment

The craft shall be provided two 6.5m RHIB with a speed of around 40 Kns. The boat shall be arranged on the aft of main deck. It shall be provided one electric hydraulic crane for handling the boats.

### 4.6 Handrail and Flag Staff

The handrails and guardrails shall be fitted on the open deck and interior walkway, for the safety of crew at sea. The staffs shall be installed on bow and stern.

#### 4.6.1 General Requirements

Stainless steel pipes shall be used for the interior walkway handrails. The

space between the handrails seats is generally not larger than 1500mm. The effective space from handrail to bulkhead should be not less than 40mm and not larger than 55mm.

#### 4.6.2 Guardrails

The guardrails of 1050mm in height shall be installed on #1 deck aft and fore open deck.

#### 4.6.3 Flag Staff

The foldable jack staff and ensign staff shall be fixed on the bow and stern respectively.

#### 4.6.4 Storm Handrails

The suitable amount of stainless steel handrails shall be installed in some of the interior walkway and other necessary locations as per user requirement. The handrails of the interior walkway are 900mm high of the deck.

### **4.7 Rigging and Linen Products**

#### 4.7.1 Rigging

4.7.1.1 All flags and shapes shall be provided with rigging.

4.7.1.2 The riggings shall be composed of steel wire ropes, fiber, rings and shackles etc.

4.7.1.3 The associated accessories of riggings include the shackles, swivels, hooks, blocks, cleats, eye plates and buckles etc.

#### 4.7.2 Linen Products

4.7.2.1 The water-proof, flame-retardant and anti-mould canvas shall be utilized as the protection covers for the outdoor equipments.

4.7.2.2 The fire-resistant & flame-retardant woolen cloth, cotton cloth or chemical fiber products shall be utilized as the protection covers for the indoor equipments.

### **4.8 Windows**

There shall be some fixed windows on the front bulkhead of the wheelhouse.

#### 4.8.1 General Requirements

4.8.1.1 The windows shall be installed in compliance with the weather tight requirements.

4.8.1.2 The fixed window frame shall be made of aluminum, with toughened glass.

## **4.9 Doors**

The doors of the craft shall principally comprise of aluminum weather-proof doors, fire-proof doors, aluminum vacant doors etc as per the user requirement.

### **4.9.1 General Requirements**

4.9.1.1 The doors shall be installed in compliance with the weather/water-tight requirements.

4.9.1.2 The door hinges shall be installed for easy operation and convenient opening.

4.9.1.3 The doors installed on the vertical bulkhead plate shall be kept parallel between the horizontal line of door and the hull baseline plane.

4.9.1.4 The depth of door frame shall be in line with the insulation thickness of the bulkhead where installed.

## **4.10 Ladders**

The inclined ladders of the main stairs shall be 55° steel inclined ladders. The other inclined ladders of the craft shall be 60° steel inclined ladders. The ladders of some not often using or as escape hatch shall be steel vertical ladders.

### **4.10.1 General Requirements**

4.10.1.1 The ladders shall be installed sturdily and reliably, not producing vibration.

4.10.1.2 The transition platforms shall be provided for the inclined ladders and vertical ladders for the deep tank if the floor height exceeds 3.5m.

4.10.1.3 The fixed eye plates shall be installed in the mid-part of the ladder for supporting if the length of the vertical ladder is larger than 2.5m.

## **4.11 Covers**

All hatch covers shall have the equivalent strength, rigidity, and water tightness as that of the hull structure where installed.

The hatch-covers on the open deck shall generally be opened forward and the internal hatch-covers shall be close to the bulkheads with the open angle larger than 90°, and with the reliable stoppers.

When the hatch covers are laid out close to the bulkheads, consideration shall be fully taken for the effective opening.

The watertight hatch covers in compartments where people often stay shall be able to open and close quickly from both sides. The watertight hatch co-

vers in the compartment where nobody works may be provided with screw-nip type fasteners.

The open/close components of the oil tank covers shall be safe and shall not produce any spark when revolving.

## **4.12 Lifesaving Equipments**

### **4.12.1 Inflatable Life raft**

Four (4) throw-type 20p each inflatable life rafts with hydrostatic releasing raft support shall be provided on each side.

### **4.12.2 Life Jackets**

Lifejackets in total shall be provided (for the 125 percent of the crew of the ship).

All lifejackets shall be provided with whistles and buoyant lamps.

### **4.12.3 Life Buoys**

8 foam lifebuoys (four with self-ignition buoyant lamps, two with self-ignition lamps & smoke signal and two with buoyant life ropes) shall be arranged on deck port and starboard.

### **4.12.4 Rescue Equipment**

To carry out rescue in rough sea, following rescue equipment to be equipped, "One life saving gantry post (a steel structure, with a pulley and recovery rope, extended outward from guardrails of a ship to recover a person from water/ sea) on each side having length of 110 m of rope"

Four-thrown-type life buoys

Two life nets for shinning up

## **4.13 Audible / Visual Signal Equipments**

The audible/visual signal equipments shall be provided in compliance with the relevant requirements of classification society.

The basic signal lamps shall be provided: one mast lamp, one P&S lamp for each, one anchor lamp, two NUC lamps and signal flags etc.

## **4.14 Compartment Equipments**

CO's room shall be equipped with single bed, wardrobe, separate attached WC/ toilet, desk, chair etc.

EXO's room shall be equipped with single bed, wardrobe, desk, chair etc.

Officers' room shall be equipped with double beds, wardrobes, desks, chairs, etc.

A common officers' WC/ toilet to be provided.

PO's room shall be equipped with double beds, wardrobes, etc.

Crew's room shall be equipped with double beds or triple beds, wardrobes, etc.

Common WC/toilet shall be equipped with close stools, urinals, commodes, showers, etc.

Offices' ward room shall be equipped with sofa, desks, chair, and other electronic entertainment gadgets, etc.

CPOs, POs and Crew's recreation room/ dining room shall be equipped with desks, chairs, LED TVs and other electronic entertainment gadgets, etc.

The beds, wardrobes, desks, chair, etc. in the craft shall be made of aluminum alloy.

#### **Availability of sickbay**

A suitable room shall be made as Sickbay to handle the ship's crew for medical treatment. The sickbay shall have two bunks and shall be situated on weather deck.

#### **4.15 Covering**

The wheelhouse, interior passages, mess room shall be planked with PVC floors; Toilets and washrooms shall be planked with non-slip brick. The battery charger room, light weapon store and gun space shall be planked with rubber floors.

#### **4.16 Insulation and Lining**

The bulkhead and cabin roof shall be covered with insulating material according to the requirement of air-conditioning.

According to the requirement of the fire zone division zone plan, fire insulating material shall be covered at one side of the bulkhead or cabin roof which may be easier to fire to protect the other side.

Lining of living rooms and rest room, above main deck, dining room, radio rooms, etc. shall adopt aluminum double-plates,

Lining of galley and toilet shall adopt stainless steel double-plates.

The surface of insulating material shall be covered with white flame-retardant fabric and shall be painted in white.

#### **4.17 Painting**

##### **4.17.1 General Requirements**

4.17.1.1 Painting shall be executed according to the relevant stipulations of the approved paint workmanship.

4.17.1.2 No painting shall be applied to the surfaces of copper, copper alloy, aluminum, aluminum alloy, stainless steel, other non-ferrous metal products and non-rust metal inside the spaces, unless otherwise required by buyer.

4.17.1.3 The colour/paint scheme for the components and region not mentioned in the colour/paint schedule provided by the buyer shall be identical with that of the surroundings or similar regions.

4.17.1.4 The prime paint of hull shall have a warranty of 5 years satisfactory performance.

4.17.1.5 Fresh water tank shall be painted with water tank paint or GRP coating.

4.17.1.6 All steel weather decks to have anti skid paints.

4.17.1.7 All fuel tanks to be epoxy painted.

#### **4.18 Hull Cathodic Protection**

The sacrificial anodes protection shall be utilized on the main hull below the waterline to against the galvanic/electrochemical corrosion. High effective aluminum alloy anodes shall be provided to ensure the protection of the hull for 36 months or ICCP System of computable size.

## **CHAPTER 5-POWER SYSTEM**

### **5.1 General**

#### 5.1.1 Rules & Regulations, Standards and Codes

The power system of this craft shall be designed and manufactured in compliance with Classification Society Rules for coast guard ships.

### **5.2 Design Ambient Conditions**

Engine-room temperature:	45° C
Relative humidity:	60%
Atmospheric pressure:	0.1MPa
Seawater temperature:	32° C

### **5.3 Power System Type**

The main propulsion system shall consist of four heavy duty medium speed marine diesel engines, driving the four sets of Fixed Pitch propellers through the reduction gearbox and shafting, auxiliary system/equipments. Three control points (wheelhouse, engine control console and local) shall be arranged. Three sets of generator make up of an automatic power plant.

The ship shall be designed to have two engine rooms and two sets of main engines in each engine room along with diesel generators and other support machinery.

One centralized control room of appropriate size shall be provided in between two Engine Rooms for operation and monitoring of all relevant machinery/ equipment.

## **5.4 Main Propulsion Diesel Engines**

### 5.4.1 Main Technical Parameters

Quantity: 4 sets/ship

Model: Air start MTU 16V4000M73L or equivalent (EU assembled marine version)

## **5.5 Reduction Gearbox, shafting and Propellers**

### 5.5.1 General

The ship shall be equipped with four sets of main propulsion plants, each of which includes main propulsion diesel engine, Flexible coupling, reduction gearbox, propeller shafting, FPP and other auxiliaries.

Reversible reduction gearbox with clutch and thrust bearing is to be used.

### 5.5.2 Reduction Gearbox

QTY: 4 sets/ship

### 5.5.3 Flexible Coupling

The flexible coupling shall be arranged between the main engine and gearbox.

QTY: 4 sets

Rated torque: As per design

### 5.5.4 Shafting and Propeller

The four propulsion shafting shall be composed each of brake, middle bearings, middle shaft, fixed pitch propeller shaft and water-lubricated stern bearings/ thordon material. Propeller shafts shall be made of high tensile forged steel. Propeller shall be made of Ni-Ai-Bronze alloy.

## **5.6 Generator Set**

5.6.1 Air start Diesel Engine Generator of appropriate model of MTU/ Cummins/ Caterpillar or equivalent model of EU/ Japanese origin is to be used for meeting electrical load during sea operations including cruising and maximum speed. The ship shall have one generator running and one as standby with parallel running and load sharing in auto, semi auto and manual mode. Additional, around 10% of rated power plus 30 KW load may also be included in load calculation and power capacity of each of two main generators for future requirement etc.

5.6.2 Emergency Generator Diesel Engine, of same OEM as per para 5.6.1, for meeting ship's electrical load in port and at cruising speed. Battery start system is required.

## **5.7 Pump**

The type of pumps provided shall be of marine version duly approved by respective classification society as per requirement to full fill the assigned tasks.

## **5.8 Major Auxiliary Equipment**

### **5.8.1 Air Compressors**

Quantity: 3 sets. (2 fixed type and one portable type)

Pressure: 5000 Psi.

### **5.8.2 Oily Water Separator Plant**

Quantity: 1 set

### **5.8.3 Sewage Treatment Plant**

Quantity: 1 set

### **5.8.4 S.W & F.W Frequency-variable Supplying Plant**

Quantity: 1 set

#### 5.8.5 Heat Water Boil

Capacity: ~300 L  
pressure: 0.35MPa  
Quantity: 1 set

#### 5.8.6 Engine Room Ventilator

Ventilator for fore engine room

Blower: 2 sets  
Exhaust fan 1 sets

Ventilator for aft engine room

Blower: 2 sets  
Exhaust fan 1 sets

#### 5.8.7 Air Reservoir

High pressure air reservoir: 5 bottles(four for main engine, one for reducing to low pressure for daily use)

Capacity: 40 L x 4 + 60 Lx1  
Pressure: 5000 psi  
Low pressure air reservoir:  
Pressure: 3.0 MPa, 1.0 MPa, 0.4 MPa

#### 5.8.8 CO<sub>2</sub> Fire Extinguishing System

Fixed type: 1 set two shots for engine room fire.

#### 5.8.9 Disinfecting and Purifying Plant of Drinking Water

Quantity: 1 set  
Treating capacity: 200L/h

#### 5.8.10 Fuel Oil Quick-closing Valve Device for each Diesel Engine

Quantity: 1 set

### 5.8.11 Reverse Osmosis Plants

Quantity: 2 set with independent system of a total capacity of 5000L per day.

## 5.9 Propulsion Monitoring & Control System

The system shall include three control stations which are bridge, ECR, and local station. Operator shall be able to perform the starting, governing and reversing of the M/E at the consoles in the bridge and ECR by remote control; When the remote control system fail to act, operator can control the M/E from the local station. Change among the three stations shall be controlled by the change of switch. The priority is that local station is prior to engine control room and engine control room prior to bridge.. MTU blue vision or equivalent for propulsion monitoring and control system is preferable.

## 5.10 Fuel Oil System

M/E and A/E shall use fuel oil supplied from the fuel oil service tanks. Each service tank shall have a capacity of at least four hours operation at sea, at maximum continuous rating of propulsion diesel and A/E. Air operated quick-closing valve is to be provided at the outlet of each fuel oil service tank.

The fuel oil to main engine is to be supplied by gravity to the M/E low pressure fuel pump through engine mounted fuel filter, engine mounted check valve, and then is drained into the high pressure fuel pump via engine mounted fuel cleaner.

Returning fuel oil from the fuel injection pump is to be drained into the storage tank via engine mounted non-return overflow valve.

Engine mounted low pressure fuel oil pump of the A/E sucks fuel oil from the service tank, then drains the returning fuel oil back into the service tank.

The fuel oil transfer pump provided in each engine room transfers fuel oil from other oil tanks to the M/E and A/E service tank. The pumps can automatically start and stop according to the level of the service tank.

Each service tank is to be provided with low level alarm for operator in engine room and ECR.

## **5.11 Lube Oil System**

Engine driven lube oil pump of each M/E sucks lube oil from the lubricating oil pan, pumps the oil to the parts that need to be lubricated and cooled. The oil then drains back into the pan.

The pre-lubricating pump is used for ensuring the start of M/E or lubricating M/E before and after it stops.

Lube oil in the stand-by lube oil tank is used for making up the lube oil consumption of M/Es and A/Es, or replacing the dirty oil in above equipments.

Each A/E, gearbox, air compressor has its own closed-cycle lube oil system. Motor driven pre-lubricating pump provided on the A/E is used for pre-lubricating when the generator starts or discharging the dirty oil in the oil sump.

Dirty oil in M/E, A/E and gearboxes can drain to the waste oil tank, then transferred onto the bank by the lube oil pump.

## **5.12 Cooling Water System**

The cooling water system shall compose of fresh water cooling and sea water cooling system.

H.T. (high temperature) F.W. discharged from the M/E shall flow into the F.W. cooler and returns to the inlet of the engine driven F.W. pump. The bottom side of expansion tank is connected with the inlet of the engine driven F.W. pump to make up the water loss of the closed-cycle system.

Engine mounted cooling water pre-heating apparatus is used for pre-heating the cooling water, and it can automatically stop when the set value of the temperature regulator is achieved.

Temperature regulators are provided on cooling pipes of M/E, which can automatically regulate the F.W. temperature toward a constant value.

Sea chest are provided in both fwd engine room and aft engine room for

each M/E and A/E. Each sea chest shall be fitted with necessary filter, zinc plate and compressed air blowing pipe.

S.W. sucked from sea chest by each engine-mounted S.W. pump is used for cooling the charge air cooler, the lube oil cooler, the F.W. cooler, and then be ejected into the exhaust damper box to cool the exhaust gas, and finally discharged outboard. One branch of the water flow from the engine-mounted S.W. pump is pumped into the cooler of the gearbox, after that, one branch of the discharged water flows to cool the bearings of the shaft system, and the other branch is ejected into the exhaust flap box to cool the exhaust gas. Finally, all these branches of water are discharged overboard.

Each A/E has its own S.W. cooling system. A/E sucks S.W. by the engine mounted S.W. pump, and S.W. flows pass F.W. cooler and lube oil cooler in sequence, then is ejected into the exhaust damper box to cool the exhaust gas, and discharged outboard finally.

Alternate sea water supply connection from fire main shall be provided to each main engine and diesel generator sea water cooling system

### **5.13 Compressed Air System**

The system shall be made up of two sets of fixed air compressor. One portable compressor of smaller size but with same pressure shall also be provided. Air reservoirs shall be provided for main engine and daily consumption and so on.

### **5.14 Intake and Exhaust System**

Exhaust pipe of the M/E and A/E is to be connected to the respective exhaust flap box, the exhaust gas is discharged outboard via the flap box. Sprinkling pipes are provided in the exhaust flap box to cool the exhaust gas.

The ventilation system of the ship is of mechanical type, fwd and aft engine rooms are equipped with two blower and 1 exhaust fan, which can provide sufficient air for the combustion of the M/E and the ventilating and cooling of engine room as well. Used air is discharged out board via the outlet.

### **5.15 Shock-resistant and Noise-reducing of Major Equipments**

Each main diesel engine shall be installed with several rubber absorbers to reduce vibration.

Rubber pipeline flexible joints shall be used between the machineries with damper and the equipment or pipes without damper, which shall make sure noise-absorb and leak-proof.

The shock absorbers must be capable to absorb vibration produced by the respective vibrating machinery.

## **CHAPTER 6-AUXILIARY SYSTEM**

### **6.1 General**

The ship auxiliary system consists of fire fighting system, daily support system, room & tank system etc.

#### **6.1.1 Rules, Regulations, Standards and Codes**

The auxiliary system shall be designed and constructed in compliance relevant Classification Society Rules.

### **6.2 Water Fire Fighting System**

Two fire fighting pumps and one portable diesel engine driven emergency fire fighting pump shall be provided in the system.

Main pipe of the system shall be divided into several separate parts for fire fighting throughout the ship and the system also supplies Sea Water for the sprinkling system, ejection pumps, washing of the anchor chain and the deck.

Each of forward engine room and aft engine room is equipped with a fire fighting pump, adequate number of fire valves, fire hose with adequate length and fire nozzles shall be provided throughout the ship.

Two (2) international shore connectors shall be provided in the vessel at port & starboard to assure that the vessel can get water from port or other ships.

### **6.3 Sprinkling System**

The system shall be used to cool the magazine and extinguish the fire therein.

### **6.4 CO<sub>2</sub> Fire Extinguishing System**

CO<sub>2</sub> fire extinguishing station shall consists of a set of CO<sub>2</sub> bottles staked on upper deck or in vicinity of engine rooms, which can be operated from bridge or from the reservoir room and through fire detection and alarm system . The system must be capable to extinguish the fire of the biggest fire hazard

compartment and must be connected to all other fire hazard compartments as well.

## **6.7 Air-conditioning & Mechanical Ventilation System**

### **6.7.1 System Function**

This system shall be integrated with the natural ventilation system to form a complete air-conditioning and ventilation system. The system shall be capable for air exchange and ventilation of all functional spaces and accommodation. The system shall provide a comfortable living and working environment for crew; conducive environment for electric and mechanical equipments.

The following design parameters shall be selected to satisfy the climate suitable for the navigation area of the MPV,

Outdoor ambient temperature: Summer: 41°C Dry Bulb  
Relative humidity: 60%

Indoor air-conditioning temperature (Living Spaces): Summer: 25±2°C  
Relative humidity: 65±10%

Inside magazine: Summer: ≤ 30°C  
Relative humidity: 60±10%

Fresh air capacity: 20~30m<sup>3</sup>/h.p

Seawater temperature: Upto 32°C

Galley shall be supplied for spot air conditioning without consideration of the design condition for air-conditioning system.

### **6.7.2 Equipment and system Buildup**

6.7.2.1 The system is to be designed in a way that whole ship load be calculated and divided over a 2-3 chill water units arranged in parallel. The system must be indirect expansion system. In case one modular chill water plant is selected, then it should have three compressors, two running and one standby.

6.7.2.2 The system shall have titanium based plate type condenser to suit Karachi harbour.

6.7.2.3 The system must have its own two in number sea water pumps. One running and other stand by. The system must also be connected with main sea water system via a cross connection valve. The system must have one supply valve connected to inlet and one discharge valve to outlet of sea water system in order to supply shore cooling water to condensers as well.

6.7.2.4 The system shall be provided with chill water system passing whole of the ship where air conditioning is required. The same is supplied with two chill water circulating pumps.

6.7.2.5 AHU be used to supply air conditioned air to compartments.

6.7.2.6 EU or Japanese brand will be preferred with R404A refrigerant.

### 6.7.3 Material

Sea water pipes shall be made of copper (alбата), and fittings and valves shall be made of copper.

The ducts supplying conditioned air shall be spiral duct pre-insulated by 12~15 mm mineral wool. The other air ducts shall be made of 0.75mm galvanized steel plate.

### 6.7.4 Testing and Instruction

After installation of the modular chilled water unit, air handlers and their system shall be commissioned, adjusted and the temperature of cabin shall be measured. The operation of the modular chilled water unit and the system should be done according to the OEM drawing and documents.

## 6.8 Refrigeration System

### 6.8.1 System Function

The refrigerating plant for the provision store shall be laid out to have sufficient capacity to refrigerate fresh provisions for 60 persons at least 7days and frozen provisions for 60 persons for at least 15 days in accordance with relevant Classification Society Rules.

The design temperature of each store as the following:

Vegetable store:  $+5^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Fish & meat store:  $-15^{\circ}\text{C} \pm 2^{\circ}\text{C}$

### 6.8.2 Equipment Buildup

Appropriate equipment and material be designed and used according to respective classification society.

### 6.8.3 System Buildup

The refrigeration system shall be of R404A direct expansion with automatic control device, includes 1 set of marine provision refrigerator plant, 1 set of air cooler for each provision store and electrical control box etc.

The refrigerator plant shall include Two (2) sets of compressing and condensing unit, and 1 set shall be standby.

The air coolers shall consist of fin coil, air circulation fan, electric motor, drip pan, solenoid valve and stop valves.

The air cooler for fish & meat store shall be equipped with an electric defrosting heater and drain pipe, which can heat automatically by timer switch.

The accessories such as dryer, strainer, valves and thermometers for each chamber shall be fitted.

A remote reading thermometer shall be fitted to each chamber and the indicators shall be mounted in the refrigerating mechanical room. Alarm bell shall be fitted in galley with signal light outside the compartment and push button arranged in each chamber. Alarm shall be connected to the machinery monitoring and alarm system. One set of ozone generator shall be equipped in meat room and vegetable room.

A sound power intercom or bell shall be provided inside the compartment.

### 6.8.4 Material

Sea water pipes shall be made of copper (alбата cu/Ni 90/10), fittings and valves shall be made of copper. Refrigerant pipe shall be made of copper.

### 6.8.5 Testing and Instruction

Equipment should be installed and tested according to the specifications of

drawings and technical document.

## **6.9 Daily Water Supply System**

### **6.9.1 Daily Fresh Water System**

One (1) frequency-variable fresh water supplying plant or as appropriate shall be installed., the frequency-variable pump can suck water from the fresh water tank, and then supply for the washing throughout the ship and for the water reinforcing of the expansion tanks of the M/E, A/Es, etc. 02 pumps be provided.

### **6.9.2 Daily Drinking Water System**

A branch of the fresh water main pipe connected to the disinfectant, drinking water goes through it and supply to galley etc.

The ship shall be equipped with two Reverse Osmosis plants to cater fresh water requirement.

### **6.9.3 Hot Water System**

Electric water boiler be provided in the ship of at least 300 l/ hour. Fresh water coming from the branch of the fresh water pipe is heated in the boiler, and then supplied for use in toilets and galley etc.

### **6.9.4 blank.**

## **6.10 Deck Drainage and Sewage Treatment System**

Two (2) separate set of sewage treatment plant shall be installed in the vessel, black water from W.C. and sickbay shall be transferred to sewage treatment plant, and sewage from shower space, bathroom and galley shall be by-passed to sewage treatment plant. No sewage shall be discharged in harbor or restricted area specified by concerning authorities. Two (2) international shore connectors be provided in the vessel port & starboard to assure that the vessel can get grey water to bank

If qualified, black water after sewage treatment plant can be discharged directly outboard in allowable sea area. The other water can be discharged outboard directly.

Water from exposed decks and deckhouse deck is drained to the below deck via leaky pipe, and be discharged outboard finally.

## **6.11 Bilge System**

One(1) set of oily-water separator be provided as well to discharge the oily water from fore and aft engine room, oily water is sucked by the multiple suck mouths device and qualified water after treated be discharged outboard. Standard discharge joints be provided on the deck as well.

In the case that engine room or the watertight room is immersed, the water should be discharged by the ejection pump via the fire fighting pipes.

Submersible pump and emergency pump be provided for the emergency discharge.

The gate valves be used for discharging the water when the ammunition room is immersed.

## **6.12 Damage Control**

The damage control and instrument console shall be located in wheelhouse with following functions:

- (1) Auto fire detection and alarm system
  - a. Controlling the engine room CO<sub>2</sub> fire system
  - b. Controlling the fire fighting pumps
- (2) Flooding alarm for each watertight hold
- (3) Indicating auxiliary equipments.
- (4) Emergency cutting off fuel oil pump and ventilator.

## **6.13 Piping Insulation**

The hot water pipes shall be insulated by the felt and covered by fine canvas, while the fire pipes, daily sea and fresh water pipes shall be protected by canvas for the sections passing through the cabins or in exposed area against freezing or condensate. The exhaust pipes of the main and generator engines shall be mainly cooled by using the water tracing pipes. The glass fiber and fine steel mesh shall be used at the points such as expansion joint.

## 6.14 Material of Different Piping System

- |      |                           |   |
|------|---------------------------|---|
| (1)  | Fuel oil system:          | Seamless steel pipes                        |
| (2)  | Lub oil system:           | Seamless steel pipes                        |
| (3)  | F.w cooling system:       | Stainless steel (1Cr18Ni9Ti)                |
| (4)  | S.w cooling system:       | Cu-Ni-Fe pipes (B10)                        |
| (5)  | Daily Fresh Water System: | Stainless steel pipes (1Cr18Ni9Ti)          |
| (6)  | Daily sea Water System:   | Cu-Ni-Fe pipes (B10)                        |
| (7)  | Fire system:              | Cu-Ni-Fe pipes (B10)                        |
| (8)  | Bilge System:             | Cu-Ni-Fe pipes (B10)                        |
| (9)  | Deck Drainage system:     | Galvanized steel pipes                      |
| (10) | Sewage system:            | 316L stainless steel pipes                  |
| (11) | Compressed air system:    | Copper pipe or stainless steel (1Cr18Ni9Ti) |

Or

As per requirement of relevant Classification Society Rules.

## CHAPTER 7-ELECTRICAL SYSTEM

### 7.1 General

#### 7.1.1 Design Ambient Conditions

All electrical equipments shall operate satisfactorily under the environmental conditions described by the relevant Classification Society Rules.

System shall be provided with normal, alternate and emergency supply.

#### 7.1.2 Protection of Electrical Equipments

The protection-type of the electrical equipment enclosures shall be as the following Table or as per relevant Classification Society Rules:

No.	Protection type	Protection performance	Adapted place
1	Prevention type(IP20)	Electrical equipment to be provided with cage, shield-plate, etc. to prevent hand from touching hot, moving and heating parts, to prevent solids with dia. larger than 12 mm from dropping into enclosures directly from above.	Dry cabins and the similar places.
2	Drip-proof type(IP23)	Vertically dropping drips shall do no harm to electrical equip. When they are inclined at 45 degrees with the vertical line. The prevented type for solid is the same as No.1.	Cabins where there is less moisture, steam, oil mist and dust and the similar places.
3	Splash-proof type(IP44)	The enclosure to be of enclosed structure and water splash from any direction shall do no harm to electrical equipments.	Cabins where the temperature change is sharp there is obvious accumulation moisture, steam, oil mist

			and dust or there is water splash and the similar places.
4	Water-proof type(IP56)	Fierce wave impact shall do no harm to electrical equipments.	The weather deck or the similar place.
5	Explosion-proof type	The explosion shall not pass on the outside part. Should it take place in the inner part of electrical parts or other harmful effects shall not ignite the surrounding explosive mediums when the equip. is proper operation.	Places such as magazine, painting room, etc. where explosion is liable to take place.

Table 7-1

## 7.2 Cables

Cables shall be of appropriate grade insulation to meet the voltage to which they are subjected. Cables shall be of the halogen free, low smoke, low toxicity type for naval ship. All cables including power cables have outer shielding.

## 7.3 Wiring System and Power System

The power distribution system shall be described as follows:

AC 3P 3W insulation system

AC 1P 2W insulation system

DC 2W insulation system

Power system of generators and consumers is as follows:

Description		Voltage(V)	Frequency(Hz)	Phase $\phi$
Generator		390	50	3
Power equipment		380	50	3
Combat system		380 or 220	50	3 or 1
Weaponry system		380 or 220	50	3 or 1
Illumination System	Normal lighting	220	50	1
	Emergency lighting	24		1
	Special light system	220 or 24	50 or as appropriate	1
	Low voltage equipments and portable lamps	24		1
Communication and navigation equipments		220 or 24	50 or as appropriate	1
Internal communication equipments		220 or 24	50 or as appropriate	1
Control, monitoring and alarms		220 or 24	50 or as appropriate	1

Table 7-2

#### 7.4 Power Plant

The MPV shall be installed with one main power plant comprising of two main diesel generator sets which are located in the engine rooms and one

emergency power plant which shall be located in the emergency generator room. Each power plant shall be coupled with appropriate size generator set. The preferred OEMs for engines are MTU, Caterpillar and Cummins or equivalent and for alternator preferred OEMs are Siemens and FG Wilson or equivalent of EU or Japanese origin.

All power plant including emergency power plant shall be able to start from local and from ECR as well.

#### 7.4.1 Generator Set

##### 7.4.1.1 Main Generator

Marine 3-phase brushless AC synchronous generator

Cooling:	Self ventilated, air cooled
Voltage:	AC 390V
Frequency:	50Hz
Phase:	3
Rated speed:	1500r/min
Character of service:	Continuous
Excitation:	Brushless, rotational excitation
Insulation class:	H
Overload rating:	10 % overload for 1 hour in every 12 hours

##### 7.4.1.2 Emergency Generator

Marine 3-phase brushless AC synchronous generator

Cooling:	Self ventilated, air cooled
Voltage:	AC 390V
Frequency:	50Hz
Phase:	3 phase

#### 7.4.2 Operation of generating unit

Each one generating set can satisfy power load demands of the MPV under

cruising condition.

Two generating sets shall be available for parallel operation. In case of failure or damage to one certain set, power system shall still be able to provide power supply to the important users. And the emergency generator set can be paralleled with main generator set by manual while necessary situation

The capacity of power plant can fulfill the requirement of up-gradation in future.

### 7.4.3 Power plant monitoring system

#### 7.4.3.1 Power plant operation mode

Two Gensets of power plant shall be available for power supply for unlimited-time parallel operation.

#### 7.4.3.2 Control mode

There shall be two control positions, namely local control of units, remote control of main switchboard. Sequence of priority is stated as follows: Local control of units, remote control of main switchboard.

Monitoring system shall have three control modes, namely, automatic control、 semi automatic control and manual control.

#### 7.4.3.3 Automatic control

- (1) Self-starting of generating unit
- (2) Auto synchronization
- (3) Auto breaking and shutdown of generating unit
- (4) Auto load sharing

#### 7.4.3.4 Semi automatic control

Semi automatic control can realize all the automatic control functions except starting or shutting off the generating sets, switching on or switching off the breakers for generating sets.

#### 7.4.3.5 Monitoring, alarm and display functions

Alarm for all generating sets can be displayed on the monitoring display.

## **7.5 Battery Bunks and Charging/Discharging Panels**

### **7.5.1 System Function**

The main function of this system is to supply the DC24V power to the consumers. The DC constant voltage charge & supply system shall be installed in the charging/discharging panel.

### **7.5.2 Battery Bunks**

Maintenance free battery shall be supplied in the MPV (except battery attached to equipment or system)

### **7.5.3 Material**

All battery bunks shall be valve regulated lead acid battery.

### **7.5.4 Charging/Discharging Panels**

The input voltage of charging and discharging board shall be AC 380V. The power supply shall be changed with battery supply to emergency loads automatically if there is a fault,

### **7.5.5 Emergency Discharging Function**

When the AC220V busbar of the main switchboard fails, the emergency lighting circuits may be automatically switched on. The emergency battery bunks shall supply the necessary emergency illumination to the whole craft. Meanwhile, the emergency battery bunks may supply the emergency power sources to all DC24V emergency consumers via the emergency charging/discharging panel.

## **7.6 Transformer Equipments**

7.6.1 At least two transformer be provided with the ship. Each transformer shall be capable to with stand the required full load of that particular voltage.

7.6.2 Emergency Transformers At least two transformer be provided with the ship. Each transformer shall be capable to with stand the required full load of that particular voltage.

## **7.7 Power Distribution System**

The important loads are directly supplied by main switchboard (MSB).

Some important loads like steering system, battery chargers, sea water pumps compressors, navigation lights, fuel pumps and communication system etc shall be supplied by the MSB and emergency switchboard (ESB)

Small capability users are supplied by the power distribution board.

### **7.7.1 Main Power Distribution System**

#### **7.7.1.1 General Statements of Main Switchboard**

##### **(1) Main Switchboard (MSB):**

The drip-proof MSB consisting of appropriate panels be installed in the central control compartment.

The two diesel generator circuit breakers shall be 3-pole Molded Case Circuit Breaker (MCCB) with long over-load delay and short-circuit short delay protections.

All the feed lines shall be protected by the 3-pole MCCB or Miniature Circuit Breaker(MCB) with overload longtime delay and short-circuit instantaneous tripping except the steering gears lines with Molded Circuit Breaker instantaneous tripping.

All the MCCB and MCB shall be capable of disconnecting the short-circuit current.

According to the Rules and Regulations, amp meters, voltmeters, power meters, frequency meters, synchronizing lamps and other kinds of switches,

buttons and indicator lights shall be installed on the MSB.

Meter for indicating polarity of shore power supply on Main switch board shall also be fitted.

## (2) Emergency Switchboard (ESB):

The drip-proof ESB consisting of 1 panel be installed in the emergency generator room. The emergency generator circuit shall consists of 3-pole MCCB with protections of over-load long delay; short-circuit short delay

The MSB and ESB shall be connected by connecting wires. All the feed lines shall be protected by the 3-pole MCCB, and all feed lines are protected with overload longtime delay and short-circuit instantaneous tripping except the steering gears lines with Molded Circuit Breaker instantaneous tripping.

All the MCCB or MCB are capable of disconnecting the short-circuit current.

According to the Rules and Regulations, ammeters, voltmeters, power meters, frequency meters, synchronizing lamps and other kinds of switchers, buttons and indicator lights are installed on the ESB.

### 7.7.1.2 Shore Power

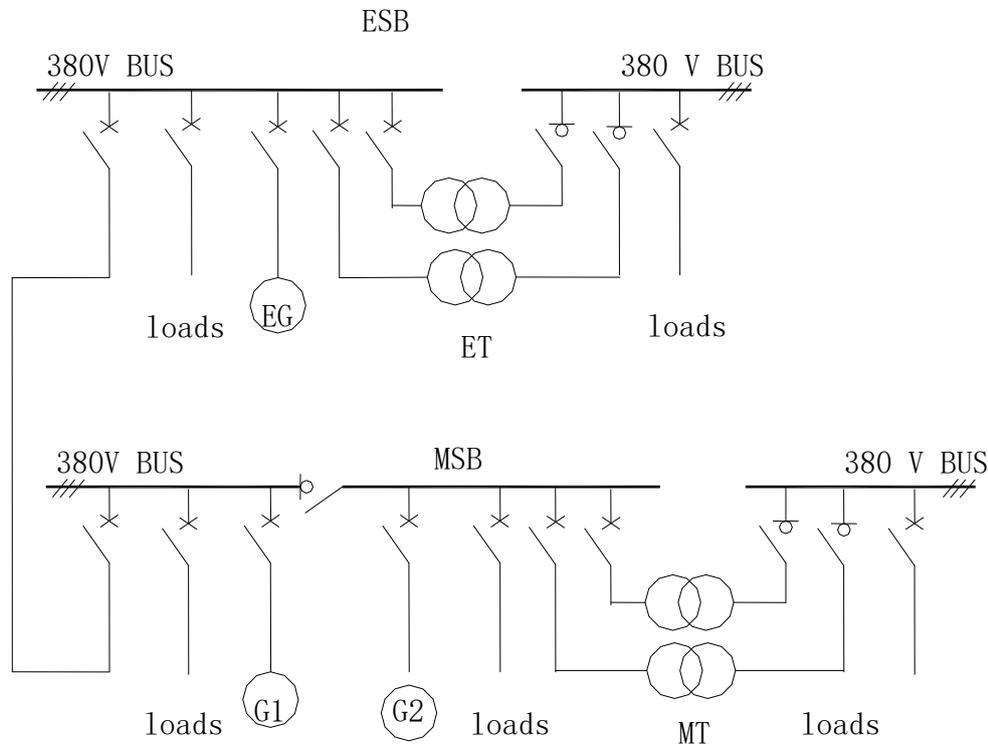
One AC380V, 3-phase, 50 Hz, shore power supply connection box shall be installed on the back wall of the superstructure with appropriate size breaker.

The length of shore supply cable shall be atleast 100 meters and stowed on winch.

### 7.7.1.3 Electrical distribution system with redundancy for some critical machinery, weapons, sensors

The critical machinery and important machinery etc shall be having the alternate power supply through auto change over switches for steering system, battery charger, sea water pumps and any other machinery as per relevant society rules while remaining on manual change over.

7.7.1.4 One-line sketch map about main power distribution system is appended below for guidance:



## 7.8 Electric Transmission and Control

The motors shall be of marine AC type. The casing protection of which shall comply with the requirements of classification society rules for the respective places.

The motors shall be of AC380V, 50Hz, 3 phase, 3-wire system; the motors

with less power shall be of AC220V, single phase, 50Hz 2-wire system or DC24V 2-wire system.

All motors 0.5kW and above 0.5kW shall be controlled by the excitation starters or control boxes.

All motors shall be directly started except for the motors above 15kW which shall be under voltage started.

## **7.9 Illumination System**

The power supply voltage of the main illumination system shall be AC220V and fed from MSB. The system shall be divided according to the different locations and provided with suitable lighting branch power boxes to supply the enough illumination for all compartments and deck levels.

### **7.9.1 Main Lighting System**

The MPV main lighting system shall be AC 220V and fed from MSB and ESB. The MPV shall be divided into two lighting zones; each has lighting distribution boxes.

### **7.9.2 Emergency Lighting System**

The MPV emergency lighting system shall be AC 220V. The MPV shall be divided into two lighting zones; each has one emergency lighting distribution box.

### **7.9.3 Temporary Emergency Lighting System**

The power supply voltage of the temporary emergency lighting system shall be DC24V and fed from the emergency battery bunks via the emergency charging/discharging panel. When 220V busbar of the MSB and ESB fails, the emergency lighting system shall be automatically switched on for power supply to the emergency lighting circuits; when the normal power supply recovers, the emergency lighting system should be automatically disconnected.

The locations where the emergency lighting is installed shall be: the engine room, mess room, wheelhouse, internal walkways, stairways, CO<sub>2</sub> store, life rafts releasing space etc as per relevant society rules.

### **7.9.3 Night Lighting System**

The power supply voltage of the night lighting system is AC220V.

The night lamps shall be installed in the internal alleyways and main walkways stairways. The lamp fixtures shall be 400 – 500mm high off the deck and red color.

### **7.9.4 Special Lighting System**

The navigational lights and signal lights shall be controlled by the control unit grouped into the wheelhouse control console, and power supply from two circuits: one is 220V from the ESB; the other is DC24V from the general service charging/discharging panels.

The navigation lights and signal lights shall be provided in compliance with the requirements of rules.

## **7.10 Bridge Control Console**

### **7.10.1 General Description**

The bridge control console shall be mounted in wheel house. It shall be provided with the integrated functions of main propulsion operating, steering gear operating, navigation, wireless communication, internal communication, broadcasting, and navigation signal light etc.

### **7.10.2 Main Apparatus Fitted on Bridge Control Console**

The bridge control console shall be fitted with the main propulsion console section, main steering console of auto-pilot, anti-rolling fin indicating panel, navigation signal light controller, fog horn controller, VHF telephone, wiper controller, spare rudder order sender and general alarm control panel etc.

## **7.11 Navigation Aid, Alarm and Recreation System**

### **7.11.1 Window Wiper**

Required numbers of electrically operated parallel window wipers shall be fitted on the windows in the Bridge.

### 7.11.2 Automatic Fog Horn

One set of auto fog horn, electrically-controlled air whistle and fog lamp shall be fitted on the brackets of the mast and controlled from the wheel-house fog horn auto controller, and power supply from AC220V navigational branch box.

### 7.11.3 Alarm System

Electrical bells or electrical sirens shall be installed in the service and accommodation alley ways, stairways and exits, control room and other place according to the rule. The system can broadcast general alarm signal, etc. About three control panels shall be provided. The system have interface with the fire detect system.

## **7.12 Damage Control and Monitoring System**

The ship shall have Damage Control Capability as per relevant Classification Society Rules.

The damage control console shall be arranged in the wheel house plus MCR. This system shall be fed from two-circuit power supply: one circuit is AC220V from the ESB; the other is DC24V from the charging/discharging panel.

Sprinkling system shall be installed in Magazine, Paint store, Wardroom, Sailor dining hall, cabins and messes.

One set of damage control alarm system shall be provided to execute the detection and confirmation on the fire and flooding to be occurred in the craft, and assist the crew in the damage control.

The main functions are: the fire alarm, flooding alarm, and the control the fire pumps, emergency cutting off fuel oil pump and ventilator etc.

### 7.12.1 Main Function of Sub-System

#### 7.12.1.1 CO<sub>2</sub> Release Alarm

One set of CO<sub>2</sub> release alarm system shall be arranged. When fire occurs in the protected area, and is ready to release CO<sub>2</sub> extinction agents to the said area, the visual/audible alarms shall be issued to the said area and the en-

trance/exist to inform the site personnel to evacuate

#### 7.12.1.2 Auto Fire Alarm System

One set of fire detection system is provided on board and main unit is fitted on DCR console. Fire detection alarm can be indicated at this main unit which is an addressable analogue system in clear text display.

#### 7.12.1.3 Flooding Alarm

The whole MPV shall be installed with flood sensor (contact switch signal) and manual flood alarm button (contact switch signal) according to specified requirements;

#### 7.12.1.4 Emergency cutting off fuel oil pump and ventilator.

The emergency cutting off buttons of fuel oil pump and ventilator shall be installed on the damage control console, and central control compartment console. In emergency like fire alarming the oil pump and ventilator can be cut off in the control room by the remote cutting off buttons. The number of the buttons on the damage control console is three. One button shall cut off all fuel oil pump and ventilator in the fore engine room. Another button shall cut off all fuel oil pump and ventilator in the aft engine room. The third button shall be cut off the other ventilator in the ship.

7.12.1.5 Rescue, Diving equipment and Boarding Party lockers on upper deck shall be provided. Forward and Aft Ready Use lockers, diving stores shall be provided as Primary and Secondary if feasible.

## **CHAPTER 8-WEAPONRY**

### **8.1 Weapon**

- a. One single-barreled 30mm naval gun (semi-automatic) to be installed on the main deck on fox'I (Front Portion of the ship on weather deck).
- b. Two 12.7mm machine guns (fitted for and supplied by PMSA) to be installed on both sides of the ship.
- c. Fitted For Arrangement of Missile system ( ) along with its associated equipment(s) e.g Radar, Ring Laser Gyro etc shall be made for future add-on.
- d. Armoury to be provided for stowage of small arms (small arms to be supplied by PMSA and stored in small arm cabinet, which is capable of storing respectively 18 pistols, 20 assault rifles, 2 light machine guns).
- e. Smoke Locker. A separate locker to be provided for smoke/ pyro ammunition stowage at appropriate place.

### **8.2 Ammunition Space**

- a. Ammunition for forward naval gun shall be arranged in forward magazine with a capacity of 500 rounds.
- b. Ammunition for two sets of machine guns shall be arranged in machine gun magazine having a capacity of 1,000 rounds.
- c. Small arms ammunition shall be arranged in machine gun magazine, totally holding about 10,000 rounds.

## CHAPTER 9-NAVIGATION SYSTEM

### 9.1 Mission

- a. To secure the safety of navigation as per relevant Classification Society Rules;
- b. To supply the data of the ship position (longitude and latitude), depth of waterline, wind direction and speed, air temperature and barometric pressure.

### 9.2 Function

- a. Have ability to provide the position information of the own ship in real time during the ship's operations;
- b. Have ability to provide the heading and speed information of the own ship in real time.
- c. Have ability to provide relative wind direction, wind speed and true wind direction and wind speed information in real time.

### 9.3 Component

NO.	ITEM	MODEL & DESCRIPTION	QTY	MANUFACTURER
1	Gyrocompass	Standard 22 or better	2	EU or equivalent
2	Magnetic Compass	Appropriate	1	(EU Origin/Equivalent)
3	Electromagnetic log		1	Do
4	ANEMOMETER		1	Do
5	GPS Navigation Receiver		3	Do
6	Echo Souder		1	Do
7	Weather Fax Receiver		1	Do
8	AIS		1	Do
9	Navtex		1	Do
10	Steering Control and Autopilot System	Scan	1	Do
11	Navigation Radar with WECDIS facility		2	EU origin such as Transas/equivalent.
12	Police alarm and lights		1	
13	Remote Search Light	1Kw	2	
14	Fixed Night Vision Capability	Appropriate	1Set	
15	Conning display		1	

### 9.4 Arrangement

- a. Chart Room

The chart room shall be arranged in the wheelhouse, and the following equipment shall be provided in this room: Meteorological Unit, Digital GPS Navigation Receiver, Echo Sounder main unit, Autopilot control stand, Navigation Radar Gyro repeater, Speed Indicator, Log junction box ,and so on.

b. Gyrocompass Room

The following equipment shall be provided in this room: Gyrocompass main unit, Log main unit, and so on.

c. Navigation Equipment Trunk

Chart stowage with hand held and other navigational instruments/equipment shall be provided with trunk

d. Other Equipment

The following equipment shall be provided in the ASP (Steering Compartment): Gyro repeater, Speed Indicator and GPS.

## **CHAPTER 10-COMMUNICATION SYSTEM**

The communication system shall be the fundamental means for communication between ship and shore command base, and for information transferring and coordinated commanding with the other ship. It shall also have the function of entertainment for the crews onboard.

This communication system is composed of two parts: external communication sub-system and the internal communication sub-system.

### **10.1 External communication sub-system**

#### 10.1.1 Mission

- (1) To ensure proper communication between ship to shore and shore to ship.
- (2) To ensure communication and cooperation with other ships.
- (3) To ensure the effective emergency communication when power supply system distribution fails.

#### 10.1.2 Communication Channel

- (1) The channel between ship and shore command base;
- (2) The channel between ship and ship;
- (3) The channel of emergency communication.

#### 10.1.3 Component

<b>NO.</b>	<b>ITEM</b>	<b>MODEL &amp; DESCRIPTION</b>	<b>QTY</b>	<b>MANUFACTURER</b>
1	500W HF Transceiver	Appropriate	1	Appropriate
2	150W HF Transceiver	Appropriate	2	Appropriate
3	VHF Radio Telephone	Appropriate	3	Appropriate
4	HF Receivers	Appropriate	2	Appropriate
5	VHF Walkie-talkie	Appropriate	10	Appropriate
6	EPIRB	Appropriate	1	Appropriate
7	SART	Appropriate	2	Appropriate
8	INMARSAT-C Transceiver	Appropriate	1	Appropriate
9	INMARSAT Mini "M"	Appropriate	1	Appropriate

#### 10.1.4 Arrangement

The VHF Radio Telephone shall be installed in the Wheelhouse, and the other radio communication equipments shall be installed in the Radio Room.

### 10.2 Internal communication sub-system

#### 10.2.1 Mission

- a. Point to point command communication;
- b. Point to group semi duplex conference call;
- c. Programmable semi duplex conference call;
- d. Authorized phone link up with broadcast system;
- e. Emergency internal communication;
- f. Broadcast and grouping broadcast;
- g. Entertainment and training.

#### 10.2.2 Component

NO.	ITEM	MODEL & DESCRIPTION	QTY	MANUFACTURER
1	Automatic Exchange Telephone	Appropriate	1 System	Appropriate
2	100W Broadcast Equipment	Appropriate	1 System	Appropriate
3	Sound-Powered Telephone	Appropriate	1 System	Appropriate
4	TV Equipment	Appropriate	1 System	Appropriate
5	CCTV Equipment	Appropriate	1 System	Appropriate

#### 10.2.3 Telephone System

The telephone system consists of Automatic Exchange Telephone and Sound-powered Telephone.

The Automatic Exchange Telephone shall be provided for ship ordering/ commanding/ managing as well as daily interior communication.

The Automatic Exchange Telephone main unit shall be installed in the Broadcast & Tele Room.

The Sound-powered Telephone shall be provided emergency communication between important spaces such as Bridge, Steering Position, Machinery Spaces, SCC, OPS Room, and so on.

#### 10.2.4 Broadcast System

The Broadcast system shall be provided for order commanding, broadcasting and receiving the radio station's program.

The system shall consist of main unit, remote control units and speakers.

The main unit of Broadcast Equipment shall be installed in the Broadcast &Tele Room.

#### 10.2.5 TV System

The TV system shall be provided to receive and broadcast the program of TV station and the play/ record the video tape for amusing and training.

The TV Equipment main unit shall be installed in the Broadcast &Tele Room.

#### 10.2.6 CCTV System

Cameras of CCTV shall be fitted at following locations: Bridge, Machinery Spaces, and so on.

Monitors of CCTV shall be installed in the Wheelhouse.

#### **Commonality of equipment/ machinery of 600 T & 1500 T MPVs**

The OEM and make/ model of equipment and machinery to be fitted onboard 600 T and 1500 T MPVs shall be same as far as possible.