





**MAZAGON DOCK SHIPBUILDERS LTD.**  
(A Govt. Of India Undertaking)  
Dockyard Road, Mumbai –400 010.

**DESIGN ENGINEERING**

**YARD 16101**

**STEERING GEAR**

**SOTR No. 3008**

**REV. NO. 1**

**DATE 16/01/2024**

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### ACRONYMS

CPP	-	Controllable Pitch Propellers
DE	-	Diesel Engine
DER	-	Diesel Engine Room
FATs	-	Factory Acceptance Trials
HATs	-	Harbour Acceptance Trials
HPU	-	Hydraulic Power Unit
IPMS	-	Integrated Platform Management System
MDL	-	M/s Mazagon Dock Shipbuilders Limited, Mumbai
OEM	-	Original Equipment Manufacturer
SATs	-	Sea Acceptance Trials
MCR	-	Machinery Control Center
STW	-	Setting to Work
CGRPT		Coast Guard Refit and Production team
ICG		Indian Coast Guard



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## SECTION - I

### I INTRODUCTION

1. This General Specifications relate to Design, approval of the equipment by the classification society, Manufacture and Supply of one ship set of Equipment for Project 01 Training Ship (TS) of Indian Coast Guard.
2. Project 01 TS consist of Diesel Engine propulsion system comprises of two propulsion plants, each plant consisting of one Diesel Engine driving a Controllable Pitch Propeller and External Fi-Fi pump through single input and twin output Reduction Gearbox and respective shaft line. Each propulsion plant broadly comprises of: -
  - (a) One Diesel Engine of minimum 5000 KW power output.
  - (b) One single input, twin-output Reduction Gearbox with built in thrust block.
  - (c) One set of shafting along with associated components
  - (d) One Controllable Pitch Propeller
  - (e) Propulsion plant support systems (for Diesel engines, Gearboxes, Shafting & CPP)
  - (f) Associated Controls & Monitoring System.
3. Class notation for Training Ship is:  
+ A1 (E) (Government Service) + AMS NIBS +ACC,FFV1-NS CS-Ready, HELIDK(SRF)  
by ABS or equivalent of LRS/DNV/GL/BV/IRS/NK
4. The Supplier should submit the quotation based on this General Conditions & Requirements (GCR) and the separate Technical Specifications for Procurement (TSP) of each equipment. Should there be any discrepancies between the GCR and the Technical specification of each equipment, the technical specification shall prevail.
5. The reference list of the equipment fitted in Indian or International Navy / Coast Guard or similar platform such as ocean going vessel, Offshore Platforms and Oil-Rigs to be submitted along with the offer.
6. The Year of production of equipment and system to be of latest manufacture (during or after Year 2023). This is to confirm to the current production standards and should have 100% of the defined life at the time of delivery.  
(other than permitted running hours during assembly / acceptance trials)
7. The list of indigenous lub oil / hydraulic oil to be furnished.



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### **GENERAL CONDITIONS AND REQUIREMENTS**

1. **Subject:** - The general conditions and requirements specified in this chapter are intended to meet the functional requirements of a Training platform with integral helicopter capable for operation in oceans environment and performance of all the ICG charter of duties.
2. **Ship's Basic Particulars:** - Project TS-01 class of ships would be Training ships for cadets. Ship's basic particulars, are indicated below: -

**Table 1**

PARTICULARS		REFERENCE DATA
Ship's dimensions	Length overall (LOA)	107 m
	Beam (water line)	15.2 m
	Draft (deep displacement)	4.02 m
Ship's displacement	Deep displacement	Around 3300Tonnes
Endurance	At cruising speed of 12 to 15 knots	7500 NM
Expected ship's life		25 Years
Operating profile	Continuous slow speeds	Below 8 knots
	Cruising	12 - 15 knots
	Maximum	20 knots
Unrestricted continuous rating of Diesel engine, at 45 degree centigrade ambient temperature		Min 5000 KW


3. **Reference Environmental Conditions:** -

- 3.1 The equipment shall be suitable for marine applications and achieve specified performance smoothly under tropical marine conditions.
- 3.2 The equipment is to be designed for continuous operation & survival under the environmental conditions specified for ambient conditions as specified table below:-

**Table 2**

Sr. No.	Design Parameter	Value
(a)	Air Temperature	Minimum of 5 deg C and Maximum of 45 deg C
(b)	Sea water temperature	32 deg C
(c)	Relative humidity	90% at 35 deg C
(d)	Atmospheric pressure	750 mm of Hg column (1000mbar)

- 3.3 **Seaway Conditions:** - Seaway conditions are defined at a sea water temperature of 1 to + 32 Deg. C, Ambient air temperature of 5 to 45 Deg. C and humidity up to 90% at 35 Deg.

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C. Salinity of water up to 35000 ppm. The equipment shall be capable of efficient and unrestricted operation without any deviation from its normal operating parameters under the seaway conditions, as below:-

**Table 3**

<b>Operational</b> (up to sea state 7)	
<b>Roll</b>	Maximum $\pm$ 22.5 degree
<b>Pitch</b>	Maximum $\pm$ 7.5 degree
<b>Survival</b> (up to sea state 7)	
<b>List</b>	Maximum 15 degree from vertical (permanent)
<b>Trim</b>	Maximum 05 degree

**3.4 Complement :**

(a)	Officers	12
(b)	Subordinate Officers(SOs)/ Enrolled Personnel(EPs)	95
(c)	Training Staff	
	(i) Officers.	08
	(ii) SOs/EPs	38
(d)	Under Trainee officers	70
	Total	223

**3.5 Propulsion Plant Operating Profile / Modes:** - The ship is to be available for exploitation for minimum of 190 days in a year. Each shaft is expected to clock a minimum of 3500 running hours per year. Expected ship's life is 25 years. Operational cycle of the ship will be of around 36 months.


**3.6 Service life of ship:** The expected service life of ship is 25 years @ 4500 hrs. annual exploitation

**4. Ship's Support Systems Supplies:** - Following ship's support supplies shall be available for the propulsion system. For electrical supplies, in case of different requirements (voltage/frequency, etc.), the equipment supplier shall provide suitable provision (transformer/converter/UPS, etc.).

**Table 4**

<b>Sr. No</b>	<b>SYSTEM</b>	<b>SUPPLIES</b>	<b>REMARKS</b>
(a)	Fuel system	LSHSD HSD	Indian equivalent
(b)	Lube oil system	Indian equivalent to be indicated by OEM	Indian Oil Ltd HPCL, BPCL equivalent
(c)	Compressed air system	High pressure air at working pressure of 30 bar & 30 cu m/hr. Suitable reduction available for working pressure at 30 bar & 7 bar.	Any other pressure requirement shall be met by the equipment supplier.
(e)	Fresh water system	Fresh water at 3 bar (approx.) shall be provided by ship's fresh water system.	Specific requirements to be indicated by equipment supplier.



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(f)	Electrical	415 V AC @ 50 Hz, 3 phase	Any other power requirement shall be met by the equipment supplier.
		230 V AC @ 50 Hz, 1 phase	

5. **Noise & Vibration:-**

- 5.1 Design of the equipment along with its associated auxiliaries/accessories/controls and mounting system, should ensure minimal vibration and noise.
- 5.2 All components of the equipment and accessories are to be designed for ensuring resistance to misalignment due to forces of vibration.
- 5.3 Suitable flexible hoses, bellows and noise reduction clamps are to be used for associated piping connections with the main equipment/auxiliaries.
- 5.4 Specific requirements on Noise & Vibration are to be as per respective equipment Technical Specification for Procurement.
- 5.5 Noise and Vibration levels of the equipment shall meet the classification rules and guidelines.

6. **Noise Levels in Machinery Spaces:** - Permissible noise levels in machinery spaces are to be in accordance ISO-6954:2000.

The noise criteria for the compartments are as follows:

Sr. No.	Compartments	DB(A)
1.	Machinery spaces	110
2.	MCR	75
3.	Work places	85
4.	Non Specific workshops	90
5.	Bridge and Chartroom	65
6.	Radio Rooms	65
7.	Cabins	60
8.	Dining Hall/Offices	65
9.	Service spaces (galley, pantry)	75
10.	Normally unoccupied spaces	90

7. **Vibration Isolators (Anti Vibration Mounts) :-**


- 7.1 For resiliently mounted equipment, the mounting system shall be capable of attenuating the vibrations of the offered equipment within the limit specified in Technical requirement.
- 7.2 The installation and connections of the equipment shall account for the extreme displacements that may occur under loading conditions. Wherever necessary, suitable stops/snubbers shall be provided to prevent excessive motion. Vibration measurements are to be carried out as per ISO 4868(XII)/latest amendment.

8. **Electrical Equipment Requirements:-** Requirements for electrical equipment (including Motors & Starters) shall confirm its latest revision / equivalent International Standards.

- 8.1 **IP Rating for Electrical Equipment:** - IP rating for associated electrical equipment enclosure is IP 44. Specific IP rating to be as per Technical specification requirement.
9. **Availability/ Reliability/ Redundancy/ Self Sufficiency:** - Maximum time required for bringing the equipment to full operational condition while undertaking daily, weekly and monthly maintenance routines, are to be indicated by the equipment supplier.





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9.1 Equipment should be robust in design for ensuring high reliability, ease of operation and minimum maintenance.

10. **Documentation:** - Various documentation will be submitted by the equipment supplier as per the scope of supply and responsibility. Quality documentation is to be submitted in comprehensive and time bound manner for meeting ship's detailed design and production targets as well as equipment production and delivery schedule. Documentation to be submitted by the equipment supplier are broadly indicated below:-

**Table 5**

<b>Sr. No.</b>	<b>Documentation</b>	<b>Remarks</b>
(a)	Binding design documentation	For progressing with detailed design, integration & installation.
(b)	(i) Quality Assurance Plan (QAP) (ii) Equipment manufacturing/ production documentation (iii) Test and Trial procedure/Reports	For approval by ABS and IRS equipment quality assurance during production and Test & Trial accordingly.
(c)	Equipment STW/ HATs/ SATs documentation	For preparing installation inspection/ Test and trials documentation
(d)	Technical Manuals for equipment operation, maintenance, logistics, etc.	For ship's crew, training and repair organizations.

10.1 All documentation (including documents, drawings, data, reports, manuals, etc.) should be in English language. Dimensional details in the drawings should be as per scale. Technical data and parameters should be in metric units (SI Units).

10.2 Following file/formats would be acceptable:-

- (a) Documents, data & reports in MS-WORD/EXCEL, as applicable
- (b) Data base files in ACCESS
- (c) Orthographic drawings (2D) in DXF/DWG format
- (d) 3D model of external topography of the equipment only in AVEVA MARINE/.STP format of max size of 5 MB.

Above drawings/data are to be submitted in soft copies in latest software version.


10.3 Hard documents to be provided suitably grouped (section wise H, E, L, Navigation & Communication etc.) indexed and in moisture proof bound folders.

10.4 **Binding Design Documentation:** - Comprehensive list of binding design documentation is to be submitted by equipment supplier, in a structured manner under various levels (I, II & III), along with time schedule. Indicative list (but not limited to) is mentioned below:-

**Table 6**


<b>Sr. No.</b>	<b>DRAWINGS / DOCUMENTATION</b>
<b>Level I : Submission within 04 weeks of placement of order by Shipyard</b>	
(a)	Technical description on main equipment along-with associated auxiliaries/components with operating principle
(b)	General arrangement drawing of equipment and major sub-assemblies along with footprint in 1:25 or appropriate scale



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(c)	Assembly drawings of main & associated auxiliaries/components including:- <ul style="list-style-type: none"> <li>• Main dimensions</li> <li>• Mounting arrangement (including details on shock mounts)</li> <li>• Bolting plan</li> <li>• Position &amp; dimension of all Interface details</li> <li>• Operational and maintenance envelopes</li> <li>• Weights</li> <li>• Materials with their specifications</li> <li>• Centre of gravity &amp; lifting points</li> <li>• Flow rate &amp; direction</li> <li>• Etc.</li> </ul>
(d)	Equipment performance data
(e)	Characteristics data, curves, efficiency, etc., related to equipment performance
(f)	Heat emission data
(g)	Equipment support systems functional specifications, as applicable along with schematic drawings (such as starting, fuel, lub oil, compressed air, intake, uptake, cooling, hydraulic, vents/drains, controls/monitoring, etc.) including interfaces with shipboard systems
(h)	Data/details for equipment foundation design and interfaces with ship structure
(i)	Any other design data/details, calculations, analysis, specifications, drawings, etc., as applicable
<b>Level II : Submission <u>within 06 weeks</u> of placement of order by Shipyard</b>	
(a)	Equipment control & monitoring data/details along-with structured list of sensors, signals & instrumentation (including in-built sensors for online health condition monitoring)
(b)	Control & monitoring interface data/details for interface with other propulsion equipment and ship's IPMS
(c)	Electrical specifications & wiring diagrams for associated electrical components, local control panels, etc.
(d)	Detailed definition of all terminal points and interfaces, major terminal box diagram, winding & performance data sheet.
(e)	Noise and vibration data/details
(f)	Any other design data/details, calculations, analysis, specifications, drawings, etc., as applicable
<b>Level III : Submission <u>within 08 weeks</u> of placement of order by Shipyard</b>	
(a)	Installation drawings, with interfaces and tolerances; main equipment along-with associated auxiliaries/components along with seat machining requirement & torque value of bolts which are tightened in situ.
(b)	Equipment alignment calculations and its procedure
(c)	Shipping/Unshipping requirements
(d)	List of special tools, instrument, Handling & lifting gear (including jigs & fixtures), as applicable forming part of deliverables and associated procedure
(e)	Flushing requirements and procedure for equipment and its support systems



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(f)	Preservation, re-preservation and upkeep procedure; including requirement of preservatives (oils, greases, etc.) with international or NATO equivalents along with chemical composition and physical properties.
(g)	Vibration Analysis; Torsional, Lateral & Longitudinal, as applicable
(h)	Reliability, Maintainability and Availability analysis
(i)	Failure Mode and Effect Analysis (FMEA) (if applicable)
(j)	Training plan
(k)	Any other documentation, as applicable

**10.5 Documentation Associated with Quality Assurance Plan, Equipment Manufacturing & FATs/Test & Trials:** - Documentation associated with quality assurance plan (QAP), equipment manufacturing and FATs(Factory Acceptance Tests), will be submitted by the equipment supplier in time bound manner, well in advance for approval by the designated classification society.

10.5.1 While preliminary quality assurance & test plan shall be submitted by the equipment supplier along with the technical offer, detailed QAP is to be submitted within 15 days after placement of equipment order, for approval of ABS and IRS class.

10.5.2 Prior to commencement of equipment production activities, equipment supplier shall consult designated Classes and Shipyard/ICG.

10.5.3 Documentation associated with equipment manufacturing would be submitted by equipment supplier progressively in time bound manner, for approval by designated classes.

10.5.4 Documentation associated with equipment FATs procedure shall also be submitted by equipment supplier well in advance in time bound manner, for approval by the designated classification society.

**10.6 Documentation Associated with STW/HATs/SATs:** - Documentation associated with equipment setting To Work (STW)/ Harbour Acceptance Trials (HATs)/ Sea Acceptance Trials (SATs), shall be submitted by the equipment supplier within the agreed time schedule, with designated classification society and Shipyard/ Indian Coastguard.

10.6.1 HATs/SATs documents shall include HATs/SATs schedule, procedure, pre-requisites, data to be recorded, time interval for data recording, formats for data recording, safety and precautions to be observed during trials, estimated time of the trials and all other relevant data/information required for the successful completion of the trials.

**10.7 Technical Manuals for Equipment (Operation, Maintenance & Logistics) :** - The technical manuals/documentation pertaining to equipment & its associated auxiliaries/support systems, shall include technical description/information, specifications, drawings, performance data, installation, operational & maintenance requirements, spares & logistics, etc., in systematic, structured & comprehensive manner.

10.7.1 Under operating instructions, pre-starting inspection/checks, starting & shutdown procedures, functional parameters, trouble shooting, fault analysis, precautions, etc. to be suitably covered.

10.7.2 Procedures for undertaking all maintenance routines till the end of service life (for





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the entire life cycle) (including major overhaul), are to be clearly specified along with preservation/ de-preservation & upkeep requirements (when equipment is not in use, during long refit of ship).

10.7.3 Procedures for setting to work, test & trials of equipment are also to be well documented.

10.7.4 Following technical manuals/documentation (in hard and soft form) shall be provided by the equipment supplier along with equipment supply.

**Table 7**

<b>Description</b>	<b>Content</b>	<b>Number of copies</b>
Technical Manuals	Technical Description and Operating Instructions Manual	7
	On board Maintenance Manual	7
	Field and Depot Maintenance Manual	7
	Installation and Testing Manual	7
	Parts and Tools Catalogue including CPL & PIL in ILMS/SLMS Format	7
Technical Documentation	Installation Drawings	7
	As fitted Drawings	7
	Applicable Standards Utilised	7
	Test Procedure and Documentation	7
	Certified Test Reports (FATs, Material Test Certificates, Calibration Certificates, Weight Certificate etc.) & Records (including Type Test Certificate). Class certification	7

NOTE: 1) Draft copy of the above listed Manuals & Documentations (in hard and soft form) shall be prepared by the supplier and shall be submitted to shipyards for comments & to classification society under copy to MDL/ICG for approval, well ahead of the delivery date of the equipment. Approval on the same shall be given within two weeks of receipt of the Manuals & Documentations complete in all respects & required format.

2) Delivery of main equipment shall be considered completed only on receipt of all **approved** Manuals & Documentations as detailed in Table -8 above.

3) All Manuals & Documentations should be categorised as per the above subject/content description only.



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**11 Quality Assurance And Testing:** Quality assurance and testing requirements, pertaining to this equipment should confirm to standard conditions of quality assurance of ABS and IRS.

**11.1 Design Standards:** Following rules and regulations as applicable shall be met:


- (a) Nominated Classification Society Class Rules.
- (b) International load line reg. 1966 as amended by Protocol of 1988 and any other subsequent amendments.
- (c) IMO/MARPOL-73/78 reg and any further / latest amendments including MS Act 58 and their rules.
- (d) COLREG 72 and any further/ latest amendments.
- (e) IMO /Anti Fouling System.
- (f) International tonnage 1969 and any further/ latest amendments.
- (g) SOLAS 1992 as amended in 2002 and any further / latest amendments.
- (h) Stability standard as per NES 109.
- (i) Naval Magazine Explosive Regulations (NMER).
- (j) Helo deck Regulation as per IRS Rules and Regulations for construction of Coast Guard Vessels (Ch-5, Section -8) or equivalent ABS/LRS/BV/DNV/GL/NK rules.
- (k) Superior/higher specifications of standard are acceptable subject to proving and satisfactory trial by Yard.

**11.2** During execution of the project, following organizations would be associated for ship design, construction, quality control and Ship trials/acceptance:-

- |     |                 |   |   |
|-----|-----------------|---|---|
| (a) | Design          | : | Shipyard / Nominated Classification society |
| (b) | Construction    | : | Shipyard and CGRPT Mumbai, at Shipyard.     |
| (c) | Quality Control | : | Nominated Classification society            |
| (d) | Ship Trials     | : | Indian Coast Guard/Shipyard.                |

**11.3 Quality Standard:** Design and production of equipment should conform to the best worldwide engineering practices, for ensuring high quality, reliability, durability, ease of operation and maintenance for meeting the ship's requirements.

**11.3.1** During equipment production the equipment shall be subjected to various stage inspections. Equipment supplier shall ensure high quality of production as per approved quality assurance plan. Quality assurance should meet the specified standards and intent of ISO 9001: 2015 (quality management systems) or its latest version.

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11.3.2 During equipment production, any deviation to the QAP/finalized specifications/standards shall be brought to the notice of designated classification society and Shipyard/ICG, along with valid reasons and recommended solution, without any compromise on quality, reliability and performance of the equipment.

**11.4 FATs-(Factory Acceptance Trials)(Acceptance Test Procedure)ATP(QAP document)**

11.4.1 In order to verify its correct assembly and operation, each equipment, shall be subjected to Factory Acceptance Trials as per established proven engineering practice. A detailed FATs program and post-test inspections to demonstrate performance characteristics and guaranteed parameters of the equipment shall be prepared and submitted by the supplier for approval.

11.4.2 All the parameters/performance required to be checked during HATs/SATs must be included in the FATs & duly noted.

11.4.3 During Factory Acceptance Trials, the supplied equipment is to be installed on the test bed and operated in the same way as it will be on board the vessel. Any correction applied for different environmental and installation conditions shall be duly notified to Coastguard/shipyard seeking their approval.

11.4.4 The testing installation shall provide for a mounting arrangement of equal stiffness as expected one for the ship structure where the unit will be seating.

11.4.5 The schedule for inspection, test & trials should be drawn up in such a way that all inspections including component level inspection, trials of subassemblies, etc., should be, as far as practicable performed at the corresponding stage of manufacture. Detailed measurements should be carried out at the appropriate stage of manufacture.

11.4.6 Factory Acceptance Trials shall be offered to, witnessed & accepted by ICG reps / Classification Society as indicated in the Purchase order. The FATs shall also be witnessed by shipyard representative.


11.4.7 The supplier shall provide a detailed program of workshop and shipboard tests and post test inspection to demonstrate the performance characteristics and the guaranteed parameters of the equipment for approval by the shipyard/ Indian Coastguard, in the technical offer.

11.4.8 All defects observed or developed during the inspection/ testing are to be rectified free of cost before dispatch to shipyard.

11.4.9 Documentation on equipment FATs procedure is to be submitted by equipment supplier in time bound manner, well in advance for approval by the designated classification society. For conducting equipment official FATs, around 12 weeks advance notice shall be given by equipment supplier to designated classification society/Shipyard/ICG, for participation in FATs. On successful completion of factory acceptances tests, complete FATs report duly certified by the designated classification society, shall be submitted to Shipyard/Indian Coast Guard within 02 weeks' time.

**11.5 Harbour Acceptance Trials/Sea Acceptance Trials:** On board trials shall be



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conducted by Shipyard based upon HATs/SATs documentation and ship's trials schedule, which would be planned by shipyard in consultation of equipment suppliers/Trial organizations/Indian Coast Guard. Draft HATs/SATs schedule in accordance to DME 303 D or equivalent International Standards is to be submitted by the firm for concurrence of ICG.

11.5.1 During equipment setting to work and HATs/SATs, equipment suppliers shall assist and offer the respective equipment trials for their successful completion. Equipment testing, tuning and any defect rectification during on board trials shall be undertaken by the equipment supplier in efficient and effective manner.

11.5.2 HATs/SATs documents shall include HATs/SATs schedule, procedure, prerequisites, data to be recorded, time interval for data recording, formats for data recording, safety and precautions to be observed during trials, estimated time of the trials and all other relevant data/information required for the successful completion of the trials.

11.5.3 Shipyard will prepare test and trial documents, based on the HATs/SATs document submitted by the supplier. The same shall be forwarded to the supplier for their vetting.

11.5.4 HATs/SATs shall be carried out to the satisfaction of ICG as per approved Test and Trial document.

11.5.5 Noise and Vibration trials shall be conducted as desired by ICG team / CGRPT. Points for measurement of vibration limits shall be indicated by OEM.

11.5.6 Supplier shall offer / assist HATs and SATs of respective equipment and attest the test and trial document forms on their successful completion.

11.5.7 The major/critical parts of the equipment shall be subject to inspections during the post-CST (SATs) dry docking of the ship.

## 12 **Maintenance & Logistics:**

12.1 Equipment supplier shall ensure high reliability and low maintenance of equipment.

12.2 While equipment maintenance and repair between major overhauls would be carried out in-situ on-board the ship, major maintenance/overhaul would be undertaken ashore by repair organization.

12.3 Equipment design should therefore ensure ease of maintenance and accessibility to important sub-assemblies/components/accessories.

12.4 Suitable provisions (such as inspection windows, etc.) as feasible, are to be made for ease of in-situ visual inspection of important sub-assemblies/components/accessories for routine inspection, checks and maintenance, without dismantling the equipment assembly/components.

12.5 Equipment supplier shall provide maintenance schedules, planned maintenance intervals and procedure for undertaking maintenance of equipment on-board and ashore.





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13 **Spares:** Installation & Commissioning Consumable, On-Board Spares, Base & Depot Spares, special tools, test equipment, etc., are to be recommended by equipment supplier, taking into account operational and maintenance requirements of the equipment. Equipment supplier shall submit comprehensive list of all types of spares & tools under appropriate category along with the technical offer. Different categories of spares & tools shall be supplied, in consultation with Shipyard/ICG, based upon ranging and scaling by ICG.

13.1 Documentation for equipment spares shall include Comprehensive Part List (CPL) & Part Identification List (PIL), for meeting ICG's Logistics Management System (LMS)/Ship's Logistics Management System (SLMS) requirements. All details on spares are to be submitted by equipment supplier in compatible format in electronic media.

13.2 **Installation Tools and Commissioning Consumables:**

13.2.1 **Installation Tools:** Special tools, jigs and fixtures & test equipment required for flushing, setting to work, testing & tuning, on-board trials (HATs/SATs) and post CST inspection of critical internal parts and reassembly of the equipment and its auxiliary systems shall be supplied. Tools shall be ordered along with the main equipment & delivered along with the main equipment.

13.2.2 **Commissioning Consumables:** The Commissioning consumables (first charge like coolants, greases, special oil, filters, gaskets, refrigerant etc.) shall be included in the scope of supply. Commissioning consumables shall be delivered before STW of the main equipment, tentative schedule of which shall be indicated in the Tender Enquiry.

13.2.3 An itemised list with cost for the same is also to be indicated in the offer to facilitate their procurement in future, if required.

13.2.4 One set of standard tools adequate for undertaking the maintenance onboard should be supplied along with the offer.

13.3 **On Board Spares (OBS):**

(i) The manufacturer's recommended list of On-Board Spares (MRL-OBS) required for servicing and maintenance, including breakdown maintenance for two years of operation after completion of the warranty period, should be included in the scope of supply. A list of On-Board Spares along with the maintenance schedule is to be submitted. The On-Board Spares and special tools shall cater to all on-board maintenance routines and possible repair requirements. Preservation requirements of On-Board Spares, if any, shall be indicated in the offer. The list of On-Board Spares required for auxiliary equipment/system shall also be indicated in the offer.


(ii) An item-wise list with cost (in LMS format to be submitted in soft copy in Excel) of On-Board Spares, special tools, and test equipment should be as per **Annexure 7**.

(iii) In case of any defect or deficiency observed in OBS while handing over to ship crew, the same may be made good by the vendor without any cost implication.

(iv) All the above OBS spares are to be duly packed in SPTA (Spare parts Tools & Accessories) boxes. For Preferred sizes and material, Refer **Annexure 8**.

(v) The Manufacturer's Recommended List of On-Board Spares has to be recommended based on the likely consumption rate of the spares and on the exploitation pattern of the equipment.



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- (vi) The Manufacturer's Recommended List of On-Board Spares has to be recommended based on the likely consumption rate of the spares and on the exploitation pattern of the equipment.
- (vii) Firms quoting lesser Manufacturer's Recommended List of On-Board Spares in terms of range and depth will have to make good deficiencies at their cost without any financial responsibility or liability to ICG/MDL within 30 days of intimation to render equipment operational.
- (viii) A certificate of sufficiency of Manufacturer's Recommended List of On-Board Spares is to be submitted by the firm for 03 years of operation of the ship.
- (ix) The Manufacturer's Recommended List of On-Board Spares should also include the spare conforming to Classification Society rule requirements for the vessel.
- (x) The ICG would have the option to amend the list of OBS proposed by the firm during the TNC of the equipment within the quoted price to ensure its sufficiency, based on its past experience of the exploitation of the same or similar equipment.

13.4 **Five-Year Base & Depot Spares/Comprehensive Part Lists:** Base & depot spares are to cover spares requirements for major maintenance/overhaul requirements for **5 years** including two refits.

13.7.1 Recommendation for insurance, on long term storage may be indicated. The firm is to submit Comprehensive Part Identification List (CPIL) and Manufacturer Recommended List of Spares (MRLS) for five years exploitation and maintenance.

13.7.2 Itemized list with cost in editable format along with a copy of the maintenance schedule for the equipment is to be provided in the offer. Itemized list (in LMS format to be submitted in soft copy in excel) of Base & Depot spares should be as per **Annexure"7"**

13.7.3 The B & D Spares shall be procured by MDL on behalf of Indian Coastguard. The B & D Spares shall be ordered at a later date, after ranging and scaling of the Spares done by Indian Coast Guard.

13.7.4 The delivery of B&D Spares shall be prior to the Commissioning of the First of Class Ship. Delivery date for the supply of B & D Spares shall be indicated in the Tender Enquiry

13.7.5 Quotation for MRL-B&D along with part no for five years exploitation with price validity for 18 months to be supplied along with the offer with item wise cost.

14 **INDIGENISATION / LOCAL SUPPORT:** (Applicable to equipment with import content)

14.1 The supplier is to indicate if the equipment is original OEM supply or manufactured in INDIA under license (specifying the import content). The manufacturer is to engage into a co-operation with a reputed manufacturer of similar equipment's in India and accordingly plan for progressive indigenization.

14.2 In this respect, the equipment manufacturer shall confirm that he will be able to authorize priority works at his works and provide the necessary local support as required to meet the ship construction and trial programme and provide the necessary after sale support to the ICG. Future plans for indigenous production of the equipment associated control/monitoring devices and transfers of technology are to be indicated in the proposal for consideration of Indian Coast Guard Headquarters.





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**15 Product Support:** Equipment supplier is to provide product support for ship's life of 25 years. In case the equipment is likely to be obsolescent, the supplier shall notify the Coast Guard with at least two years prior notice, along with valid reasons and recommended solution.

- a) The firm/OEM to submit undertaking to provide product support for minimum period of 25 years from date of delivery of the vessel.
- b) Undertaking for upgrade/currency of software for all equipment min 05 years from date of delivery of vessel. In case of obsolescence within 05 years from date of delivery of the Training ship, the same to be upgraded without any additional cost.
- c) Firm to indicate after sales and product support facilities in India with response time for attending defect and providing spares.
- d) All upgradation and modification carried out on equipment during its life cycle must to be intimated to ICG. Further, any upgradation/modification during guarantee period of the equipment same to be included free of cost.
- e) Firm should agree to enter into the rate contract / All-inclusive Annual maintenance contract (AIAMC) with ICG for maintenance and supply of spares.

**15.1 Operational Cycle: The operating refit cycle of ship is as follows:**

- a) 1<sup>st</sup> and 2<sup>nd</sup> Ops refit cycle – Operation cycle of 24 months followed by a refit.
- b) 3<sup>rd</sup> and 4<sup>th</sup> Ops refit cycle – Operation cycle of 18 month followed by a refit.
- c) Balance Ops and refit cycle – Operation cycle of 15 month followed by a refit.
- d) First three refits are short refit (SR) followed by a normal refit (NR). Second NR will be medium repair (MR).
- e) Short refit is for duration of 04 months. Normal refit is for duration of 05 months and medium refit for duration of 12 months.

**16 Materials:** A component wise material list (with specifications) is to be provided by the equipment supplier. Standard materials for use on board ocean going ships are only to be used. Various materials used shall be in accordance with the stipulated requirements as per international Standard, as stated in the equipment technical specifications. Any deviation from specified materials is to be informed to Shipyard/Indian coast Guard in the Deviation List placed at **Annexure- '2'** with suitable reasons and justifications, subject to the condition that the material meets the requirements for envisaged marine application.

**16.1 A separate declaration stating that no asbestos materials are used in the product is to be submitted along with offer and also post manufacturing during equipment delivery.**

**17 Interchangeability:** Equipment design is to ensure that components and parts having same dimensions and characteristics should be inter-changeable between different units of similar kind in the ship, without affecting the specified equipment performance.

**18 Tally and Diagram Plates:** All major components, including fittings such as valves, cocks, levers, gauges, switches, etc., should be provided with suitable identification tallies for appropriate identification. Tally plates shall be in English language and in SI units. All tallies and diagrammatic plates shall be of SS/ chrome plated. Tallies for safety, caution & warning considerations should be in bold black letters on a fluorescent



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orange background. Diagrammatic plates indicating details of connections are to be provided / affixed near the terminal box of the motor. Size of tally plates, diagrammatic plates, etc. shall conform to International Standards.

18.1 Arrow marking for direction of rotation of motor shall be provided by supplier. This tally shall be made of SS/ chrome plated and properly secured on the motor.

18.2 Motor details such as HP (kW), Starting Current, Full Load Current, rpm, Insulation, Weight, Maker's Name, Sr. No. of Machine, Year of Manufacturing, Weight of Equipment, IP Rating of the equipment etc. shall be given in the motor tally plate.

18.3 Danger labels in Red colour with white lettering are to be provided on all electrical equipment operating on 150Volts or higher

18.4 Motor winding terminals ending at Connection Box shall have engraved tally number.

18.5 The diagram plate, which is fixed on the rear side of the front door, shall have complete wiring diagram of the starter with sub-component identification number. The same identification number shall be engraved on the components fitted on the starter.

18.6 Internal Cable-Cores terminating at the connection terminal strip shall have the same corresponding terminal ferrule no. Fixed / fitted on it.

18.7 Tally of JB/Panel and other equipments internal diagram plate to be prepared by OEM.

18.8 Cable Tallies as per approved system drawing to be prepared by OEM.

18.9 Cable tallies should be supply for both the ends.


19 **Instruction Plates:** Instruction plates listing the starting/shut-down procedure and precautions in brief are to be prominently displayed on the equipment. The Instruction plates are to be SS/ chrome plated. Equipment is to be supplied with a set of instruction plates duly mounted on equipment or supplied loose.

20 **Painting Specification:** Paint scheme for the entire ship shall be strictly as per CGBR 382 (Issue: 2). Tin free Self-Polishing Coat Antifouling Paint Scheme as per latest IMO regulations shall be incorporated for underwater hull. However the paint schemes for bilges in machinery spaces, F/W tanks, Ballast tanks, etc., shall be proposed by yard shall be suitable for half-life of ship. For weather decks, except helo deck, non- skid epoxy deck covering scheme shall be used. Skeg to be filled with anticorrosive compound or PUF and maintenance procedure shall be specified. Suitable anticorrosive paint shall be applied inside foam tank. Performance Guarantee of minimum five years shall be provided by Paint manufacturer.

20.1 **Painting:** Following general guidelines shall be adhered to:

(a) Surface preparation and painting shall be strictly performed in accordance with paint manufacturer's recommendation unless other instructions are included in the schedule.

(b) Painting shall be carried out by airless spray, brush or roller as stated in the method of application in the painting schedule.

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- (c) Painting for the parts or spaces not specified in the painting schedule shall be similar to surrounding spaces or comparable spaces. Pipes shall be painted with bands of distinguishing colors.
- (d) Time schedule of Painting of each coat shall be decided according to the builder's construction schedule and to the painting interval between coats as stated in the painting schedule.
- (e) Painting of machinery and electric equipment shall be as per the manufacturer's standard but finish colour shall be in accordance with painting schedule, wherever specified.
- (f) In compartments containing electronic or other precision equipment, the equipment shall be shielded and protected adequately during painting.
- (g) All steel decks exposed to weather shall be painted as per approved scheme.
- (h) All seating shall be painted similar to that of surrounding areas

**20.2 Surface Preparation:** All steel plates and profiles before fabrication shall be blasted to SA 2.5 and shop primed. Painting of surfaces and structures shall be maintained throughout during the process of construction by repainting of burnt surface due to gas cutting, welding and expiry of primer applied on the surfaces. Preparation of surface before final painting shall be as follows:

- (a) **Steel Surfaces.** All surfaces of main hull above boot topping line shall be thoroughly wire brushed and cleaned, also chipped where necessary so as to remove all loose mill scales, weld beads and make the surface smooth and free from rust before final painting. All exterior under water surfaces below upper boot topping line shall be blast cleaned to SA 2.5.
- (b) **Light Alloy Surfaces.** Light alloy surfaces shall be previously treated by degreasing of all light metal parts and protected with primer coating.
- (c) **Wooden Surfaces.** Before priming wooden parts shall be carefully smoothed and cleaned of dust. Fire retardant paint shall be applied on the wood to impart the fire retarding properties.
- (d) **Inspection/Clearance.** All surfaces prior painting is shall be mandatorily inspected and cleared by a joint inspection team of paint manufacturer's rep and OVERSEER rep.

**21 Lifting Arrangement:** Equipment components weighing more than 40 kilograms are to be provided with eyebolts/lifting arrangement, for ease of handling/lifting on board the ship or ashore. During transportation/transit of equipment, adequate provisions (such as supports, locking arrangement, jacking, etc.) are to be made for preventing any damage to the equipment & its associated components. Any component requiring special handling shall be clearly marked and appropriate handling instructions shall be provided by equipment supplier. One set of special lifting gear (if any) shall be supplied to shipyard.

## **22 Preservation / Conditioning:**

**22.1** Equipment supplier is to provide high quality packing for the complete scope of supply along with handling arrangements. The package/container should display clear instructions for stowage, handling, care and accessibility for inspection of equipment preservation condition.





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22.2 Equipment shall be supplied with Initial preservation for a period of 12 months for tropical conditions and protected against high humidity. The equipment is to be preserved on delivery as per the standard marine engineering practice. Closing plates/plugs/caps (duly filled with nitrogen gas) are to be provided on all openings.

22.3 For re-preservation requirements, at shipyard or on board ship beyond initial preservation period, suitable provision is to be catered for by equipment supplier. Equipment supplier shall provide re-preservation & upkeep procedure, preservatives/consumables and technical assistance/supervision to the shipyard, as per requirements ( if special equipment/Pumps, hoses, fittings, etc. required shall be brought by the supplier along with them for carrying out the preservation on board the ship.

22.4 In the event of storage getting extended beyond a period of 12 months, re-preservation shall be carried out on 6 month extensions basis. The conditions and cost shall be stated in the offer for further two re-preservation of 6 months. Details of the preservative used (oils & greases etc.) and the procedure for de-preservation and re-preservation, in shop or on board the ship, shall be indicated in the offer.

22.5 Preservation requirement, procedures and schedule for main equipment, OBS and B & D Spares are to be indicated in the offer.

### **23 Packing & Shipping:**

23.1 All equipment shall be adequately packed and protected with supports to ensure adequate protection during all methods of transportation. Each unit within a package/container shall be clearly marked in English for identification. The container shall clearly indicate the commodity description with caution marks, weight, size, etc.

23.2 A separate document giving complete details & instruction for storage, preservation, handling & transportation after delivery shall be supplied & a copy must be included with the shipping document. The supplier should indicate the delivery schedule port of embarkation, transport, packing, preservation, insurance etc.

23.3 The instrumentation, sensors and meters etc. which are fitted on the equipment are to be removed from the equipment and shall be staggered delivered according to shipyard schedule in a separate suitable box/packing during STW.

23.4 Following items shall be packed in separate containers/boxes with proper colour coding (with description) & list of their contents in English for their easy identification and traceability:

23.4.1 Deliverables related to Main Equipment (to be marked in green colour).

23.4.2 Deliverables related to Auxiliary Equipment (to be marked in green colour).

23.4.3 Deliverables related to Installation material and Tools related to Main & Auxiliary Equipment (to be marked in green colour).

23.4.4 Commissioning consumables and Tools (to be marked in green colour).



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- 23.4.5 On Board spares and Tools (to be marked in red colour) in SPTA boxes.  
23.4.6 Base & Depot Spares (to be marked in red colour).  
23.4.7 Documentation (to be marked in blue colour).  
23.4.8 The list of actual deliverables against each of the above serials shall be forwarded to shipyards in soft copy (MS Excel format) with required part nos. within one week of finalization of PNC in order to detail them in the purchase order.  
23.4.9 Packing list should give further breakup of items, wherever particular item is quantified by set.

#### 24 **Training :**

- 24.1 The equipment supplier is to impart training, to ship's crew, on aspects related to operation, installation, maintenance and repair of the equipment.  
24.2 For imparting training, complete training package in hard & soft form (including suitable training material, docket, computer based aids, etc.), is to be provided by the supplier to the participants.  
24.3 Training would be conducted by the equipment supplier at Shipyard/ On-board Ship. Training plan will be submitted by the equipment supplier, along with the technical offer. Training is required to cover the following aspects (but not limited to):  
(a) Design and installation  
(b) Operation and trouble shooting  
(c) Control & monitoring  
(d) Upkeep and routine maintenance  
(e) On board maintenance including major repairs and overhaul.

**25 Security of Information:** The information contained in this document is not to be divulged to any other firm/third party without the prior permission of the Indian Coast Guard and MDL. Adequate measures are to be taken to ensure safe custody of this document.

#### 26 **Warranty:**

- 26.1 The equipment along with associated auxiliaries/components shall be warranted by the equipment supplier for the stipulated performance for a period of twenty (20) months from the date of delivery of equipment to MDL or twelve (12) months after planned delivery date (D) (mentioned in succeeding Para) of the ship by shipyard MDL to the Indian Coast Guard, whichever is later. This is to be referred as 'Standard Warranty'.  
26.2 During the said period of 'Standard Warranty', the equipment supplied shall be warranted against any malfunction, defects, material failure, non-compliance to ordered specifications, sub-optimal performance, design deficiency, poor workmanship and quality. Any expenditure on account of equipment malfunction, repair or supply of spares against warranty defects shall be borne by the equipment supplier. If any defective part is required to be taken back to OEM's factory/works (i.e. importing and re-exporting from Country of origin) for the purpose of service, the entire liability including expenditure towards the same shall be borne by the supplier. The spare parts required / consumed for scheduled servicing & maintenance activities in the period of 'Standard Warranty' shall also be provided by the OEM without any commercial implication.



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- 26.3 The Supplier warrants for a period of 12 months from date of acceptance of the Training ship by the Shipyard at the designated Indian port or as applicable, that the vessel and the associated equipment and service supplied under this contract and each component used in the manufacture there of shall be free from all types of defects/failures.
- 26.4 In case of systems/equipment, which have not completed trials prior delivery, the warranty of that particular system/equipment and service would commence from the day of successful completion of trials. The Supplier will undertake update (if any) of software's for all equipment up to 5 years from the date of acceptance of the vessel.
- 26.5 Warranty of the equipment would be extended by user in log book, Spares and all consumables required for warranty repairs shall be provided free of cost by Supplier. All activities including diagnosis, rectification, calibration, transportation etc., required for making equipment serviceable and available would be Supplier's responsibility.
- 26.6 The Supplier also undertakes to diagnose, test, adjust, calibrate and repair/replace the goods/equipment arising due to accidents by neglect or misuse by the operator or damage due to transportation of the goods during the warranty period, at the cost mutually agreed to between the Shipyard and the Supplier subject to acceptability by the Shipyard. The Supplier shall intimate the assignable cause of the failures.
- 26.7 Supplier hereby warrants that necessary service and repair backup during the warranty period, shall be provided by the Supplier and he will ensure that cumulative downtime period for the Training Ship and or the fitted equipment /system equipment does not exceed 45 days of the warranty period. Thereafter, the Shipyard reserves the right to make good the defects at suppliers risk and cost.
- 26.8 If the associated equipment and service, spares of Training Ship fails frequently and/or, the cumulative down time exceeds 45 days of the warranty period or a common defect is noticed repeatedly with respect to a particular item/component/sub-component, that complete item/ equipment shall be replaced free of cost by the Supplier within 45 days of receipt of the notification from the Shipyard duly modified/upgraded through design improvement in all equipment supplied/yet to be supplied and Engineering Support Package (ESP) supplied/yet to be supplied. Thereafter, the Shipyard reserves the right to make the defects at Supplier risk and cost.
- 26.9 In case the complete delivery of the ESP is delayed beyond the period stipulated in this contract, then the Supplier undertakes that the warranty period for the goods/stores shall be extended to that extent.
- 26.10 The Supplier warrants that the Training ship, the associated equipment and service supplied will conform to the Temperature and Humidity conditions as mentioned in this document.
- 26.11 The Supplier agrees to provide back to back warranty of equipment /system or any other item whose specified warranty by the OEM is more than 12 months and shall



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extend the same warranty to the Shipyard at no. additional terms and conditions.

26.12 **Extension of Warranty:** Supplier shall mandatorily indicate, in the offer, the annual rate for extended warranty period, in the event of expiry of warranty period as detailed above along with the attendant commercial terms and conditions if any.

27 **Planned Ship Delivery date(D):** The planned date for delivery of the Ships to the Indian Coastguard by MDL are tabulated below:

Ship no.	Yard No.	Planned Delivery date
1	16101	October 2026

28 **Weight Recording / Weight Certificate:** Weights of all components are to be recorded and a suitable certificate shall be submitted, by the equipment supplier. The designated inspection authorities shall countersign such certificates. Format for weight control data sheet, is placed at **Annexure '3'** of this document.

28.1 Net weight of each component is to be recorded in presence of designated inspection authority and the weight certificate is to be submitted by the equipment supplier, along with equipment supply. Format for weight certificate, is placed at **Annexure '4'** of this document.

28.2 The supplier shall have to submit, reasons for variation between allocated weight and actual/certified weight for each and every item, wherever applicable, to Coast Guard and MDL for their consideration and further necessary action.

29 **Maintenance Management Software:** A Maintenance Management software package for Ship Maintenance, Planned Preventive Maintenance (PPM), Defect Record & Tracking and Maintenance Forecast & Planning as per CG requirements shall be installed and commissioned.

29.1 The software package shall be capable of indicating Maintenance Routines falling due on various equipment fitted on-board and spares requirement, as per OEM promulgated schedule.

29.2 The software will be capable of interlinking on-board spares with actual spares requirement and indicate future requirement to meet Minimum stock level.


29.3 OEM is required to submit the inputs such as routine schedule, spare requirement etc. in the format enclosed at Annexure-9

### 30 **Technical Assistance:**

30.1 The Supplier shall provide the necessary representative(s) **as and when required**, in carrying out inspection and supervise the work that is done on the equipment, during the following phases:

- Preparation for installation of equipment by shipyard.
- Monitoring of proper equipment preservation during storage.
- On-board erection and alignment.
- Setting to Work (including fitment of latest calibrated instrumentation).



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- (e) Harbour Trials.
- (f) Assistance in trouble shooting.
- (g) Customer Sea Trials
- (h) Post CST equipment Inspections.
- (i) Final Machinery Trials.
- (j) Assistance in operation during equipment guarantee period.

30.2 The supplier shall indicate total cost for executing all technical assistance activities mentioned above, in the price bid. Activity-wise cost break up shall also be given in the price bid, to facilitate the payment on satisfactory completion of the activity.

30.3 Shipyard has to progress on ship construction activities, simultaneously on ships of the coastguard project or on ships of different projects. View this, there shall be every likelihood of clash of requirement of technical assistance. In such eventuality, in order to avoid delays on one ship due to similar work requirement on other ship, supplier shall depute their dedicated separate/independent team of supervisors/specialists for required technical assistance, on the required ships. Rotation of supervisors/specialist amongst the various ships/projects shall be avoided.

30.4 The supplier shall provide checklist for installation, setting to work, HATs & SATs to the shipyards to ensure the completeness of the activities by shipyards in order to avoid waiting period of the supplier specialists.

31 **Receipt Inspection:** Receipt inspection for the major equipment shall be carried out in the presence of OEM rep to verify completeness of the scope of supply and intactness of the supplied equipment. Defective / damaged parts and deficiency, if any, in supply shall be made good by OEM free of cost. OEM shall be intimated the date of receipt inspection.

32 **Price:** Price bid shall include cost of all deliverables and services as mentioned in tender. Break-up in percentage of total quoted cost of main equipment for its various components shall be indicated by the supplier. Non-indigenous equipment Suppliers are to indicate the import content in USD/EURO.

33 **Compliance Matrix:** Para-wise compliance matrix, including paras which are not applicable, as per the technical specifications (contained in this document) shall be submitted by the equipment supplier along with the technical offer, in the format as per Annexure-5 (preferably in excel sheet). The technical offer received without Compliance Matrix shall be liable for rejection.

34 **Technical Offer as Per Shipyard Tender:** Technical part of the offer with respect to the equipment and its associated auxiliaries/components/controls, to be submitted by the equipment supplier in comprehensive, systematic and structured manner, as per the requirements mentioned in this document, including the following (but not limited to): Vendor to submit the check list as per Annexure-6 :

- 34.1 Equipment specifications.
- 34.2 Equipment performance data





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- 34.3 Characteristics data, curves, efficiency, etc., related to equipment performance
- 34.4 Outline general arrangement drawings of equipment with footprint, main dimensions, weights and mounting arrangement, with recommended maintenance space.
- 34.5 Requirement of Ship services (Power rating, Sea/Fresh water, Compressed Air etc.)
- 34.6 Associated support systems specifications and drawings.
- 34.7 Interface requirements.
- 34.8 Relevant drawings with all views and maintenance envelopes.
- 34.9 Control and monitoring system along with complete list of sensors and instrumentation (in structured manner).
- 34.10 Mounting data/details and characteristics
- 34.11 Structure borne and airborne noise performance levels (in graphical & digital format).
- 34.12 Comprehensive list of binding design documentation in structured manner along with time schedule for submission.
- 34.13 Associated electrical equipment specifications and drawings.
- 34.14 Recommended list of installation & commissioning Consumables, onboard spares, base & depot spares, special tools, test equipment, etc., in systematic manner.
- 34.15 Indigenization plan, work-share, MOU / Definitive Agreement / License agreement, technology transfer, product support, etc.; as applicable.
- 34.16 Training plan
- 34.17 Preliminary quality assurance and test plan. (QAP)
- 34.18 Compliance matrix (Para-wise compliance to tender specifications).
- 34.19 Complete Weight breakdown for major components (excluding & including oil).
- 34.20 Requirement of Greases, Oils etc., with their Indian equivalents.
- 34.21 Proposed plan for technical assistance for installation, preservation and commissioning, trials, etc.
- 34.22 List of main and auxiliary equipment included in the standard scope of supply with NCN (NATO Code Nos.).
- 34.23 List of items required for auxiliary systems (shipboard systems), which are essentially, be fitted for proper functioning of main equipment with NCN. Also indicate any of them, which are not supplied along with main equipment.
- 34.24 List of Instrumentation & Diagram.
- 34.25 Clear demarcation between the scope of supply of firm and that of the yard.
- 34.26 Trial and commissioning time of complete system on board.
- 34.27 Delivery time from receipt of order.
- 34.28 List of special tools, instruments, jigs & fixtures & facilities required for lifting, transporting, aligning, installing and commissioning of main equipment and their auxiliaries.
- 34.29 Type approval
- 34.30 The specification relates to design, manufacture, supply & commissioning of System / equipment to be used in Indian Coast Guard Ship.
- 34.31 Manufactures may be guided by this document to ensure that their products meet the standards of Installation on Indian coast guard ship.
- 34.32 The drawing & dimensions are for reference purpose only. Vendor to design the equipment based on technical data supplied.
- 34.33 The offer should be strictly conforming to the details indicated in this specification



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and in the relevant specifications / drawings / documents (All Latest Issues are to be followed).

- 34.34 No omission in the Specifications shall relieve the supplier of his responsibility to ascertain these requirements to perform work & furnish material in accordance with codes specified.
- 34.35 The offer should be complete with all relevant details such as Detailed Technical Specification, Material Specification, Overall Dimensions, Maintenance requirement, Foundation / Installation / Bolting, Storage/ Preservation Details, supported by drawings/documents/data sheets etc.
- 34.36 Any clarification required regarding Technical Specification / Requisition should be sought before submission of the offer.
- 34.37 Four copies of technical offer shall be submitted by equipment supplier; in hard and soft form (CD-ROM).

### 35 **INSTRUMENTATION:**

- 35.1. Safety, control and monitoring devices are to be fitted on equipment as per requirement. All Miscellaneous items are to be fitted as per functional requirement of the system. All piping material with necessary instrument & accessories & Instruments are to be fitted.
- 35.2. Any other instruments & accessories not listed however are required for satisfactory operation as supplier design shall also be part of scope of supply.
- 35.3. If applicable, 100mm dia. pressure and vacuum gauges (complete with needle valves, nuts and nipples) and thermometers should be supplied for the machinery equipment under supply as per technical, specification and these should be indicated in the installation drawings for the unit. Pressure gauge cocks should be provided with vent holes.
- 35.4. All the thermometers should be brass cases. Suitable pockets/sockets should be arranged on the equipment for fitting the pressure gauges and thermometers.
- 35.5. All the pressure gauges and thermometers should be marked in kg/sq.cm or bar and deg. Celsius respectively. All the pressure gauges and thermometers scale ranges should be selected so that the maximum normal operating pressure and temperature respectively will be approx. 75% of the full-scale range.
- 35.6. Temperature sensing should have the facility to allow for instrument removal without impairing the integrity of the system.
- 35.7. Pressure gauges should be provided with valve arrangements to allow for instrument isolation and removal, without impairing the integrity of the system.



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## SECTION II TECHNICAL REQUIREMENT

### 1. Technical Specifications

Two electro-hydraulic power units, along with Control (Non Follow up, Follow – Up and Auto pilot) each capable of delivering full torque having rudder area 5.64 sq. m approx. shall be provided meeting the Class rule requirement for Twin Screw- Twin Spade Balanced Rudder Training Ship of ICG suitable to work on 415 V, 3Ph, 50Hz electric supply. **However Firm will calculate the correct Torque and Rudder Area to prove its adequacy on the basis of ship particulars as shown in Table 1.**

1.1 Two streamlined spade balanced rudders with NACA0015 profile driven by electro hydraulic steering gear controlled from bridge in both Follow- Up (FU) as well as Non Follow Up (NFU) mode shall be supplied with rudder, rudder stock, tiller arm, actuators, bearings, hull unit complete with insert plate, stiffeners, rudder trunk with flange, gland and packing, piping systems to suit Steering Gear compartment layout including lube oil system, Greasing Pump and piping, controls, power supply for control systems, etc. Facilities shall include remote start & stop of the steering gear pumps from the bridge console, MCR and local. Operating indications of both the units shall be provided at main wheelhouse console, machinery control room and in steering gear compartment.

1.2 An independent emergency steering system shall be provided as per Class to cater for all steering requirement in case of failure of main steering gear Control.

1.3 Rudder shall be of fully welded construction made of mild steel. Surface of rudders shall be smooth and external welds shall be ground flush with contour. Rudder Stocks shall be designed for good engagement and to facilitate unshipping. For handling rudders, recessed lifting fittings or holes shall be provided on rudder, on at least two corners. Each rudder shall be fitted with two drain plugs. Rudder stocks shall be of forged steel. Rudder and rudder stock shall be built/ fitted to classification society requirements. **The distance between two rudder stocks is 5500 mm tentatively.**

1.4 The steering gear will be connected with autopilot, which will be supplied by OEM of IBS. The Auto pilot with analogue repeater in wheel house shall form part of steering control system and shall comprise of Desk Top Operator Unit ,Control Unit with FU amplifier, Feedback unit etc. Necessary interface shall be arranged to the Steering Controls. Like other Navigational Equipment, Auto pilot will be integrated with the Integrated Bridge System under NIBS.

1.5 Synchronizing of Two Rudder Stocks will be mechanical through Tie Rod with ball joints at ends.



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## 2. Scope of Supply:

2.1 Scope of supply will cover Design, Manufacture, Inspection, Testing, Commissioning, Packaging and Forwarding & Satisfactory Operation on board ship for all the equipment's, fittings & instruments listed in this specification during ship trials & ship cruising.

2.2 The manufacturer shall provide all information required for integration of the equipment on board the ship. The equipment shall be designed and constructed so that it can be fully integrated with the subsystem to which it interfaces. All components shall be compatible in order that the functional performance of the equipment is not degraded as a result of its integration within the system as a whole.

2.3 The list of equipment's to be supplied along with accessories & instruments are as follow:-

Sr. No.	Description	Quantity/ Ship sets
1.	<b><u>Mechanical System:</u></b>	
2.	Rudderstock Assembly including Rudder	02 Nos.
3.	Mechanical Locking Pin Assembly	02 Nos.
4.	Synchronizing Link Assembly	01 No
5.	Feedback Units	02 Nos.
6.	Rudder Angle Transmitter	As Required
7.	Lubrication Units	02 Nos.
8.	Hydraulic Actuators	As Required
9.	Anodized aluminium scale for Rudder angle over rudder assembly	As Required
10.	Mechanical rudder angle indicator on each tiller arms	02 Nos.
11.	Semi rotary hand pump	01 No
	<b><u>Hydraulic System:</u></b>	
12.	Power Pack with resilient mounts and foundation bolts (Mounting Frame, Electric Motor, Variable Delivery Pump, Flexible Coupling, Oil Cooler, Hydraulic Accumulator, Electro-Hydraulic Servo Valve, Filters, Flexible hoses and Pressure gauges on hydraulic accumulator to monitor pressure of nitrogen in the bladder at static and running condition)	02 Nos
13.	Pump Isolation Manifold Block	02 Nos
14.	Emergency Steering System as per class rules. Hand wheel and helm pump to be supplied in steering compartment.	01 Set
15.	Overhead Supply Tank	02 Nos.
16.	Reserve Oil Tank	01 No.



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17.	Distribution Valve Block	01 No
18.	Piping complete with flanges/couplings	As Required
19.	Hydraulic System Sensors	As Required
	<b><u>Electrical</u></b>	
20.	Gyro Repeaters in Steering Gear compartment	02 Nos
21.	ACOS	01 No
22.	Display Unit in IBS	01 No
23.	Autopilot with rudder angle indicator (Steering gear compartment, machinery control room (MCR), Trainees Bridge & wheelhouse)	04 Nos
24.	Panorama type rudder angle indicator	03 Nos.

- 2.4 Mid ship locking pin arrangement on tillers and should be designed and supplied by steering gear supplier accordingly.
- 2.5 The firm should supply one set of hydraulic Pipes, valves, fittings, connectors, flexible hoses. Pipe clamps for satisfactory operation of complete system on-board installation as per final approved layout. Pipes. Valves and fittings should be of stainless steel to AISI 304. A tentative list of the same to be indicated by firm.
- 2.6 Rudder & Rudder stock is a classification item and the classification survey should be carried out by Classification Society. It is to be confirmed that firm has understood the class requirement and their supply will meet the same. All the classification charges are to be paid by the firm.
- 2.7 All the items requiring machining at site should be provided with sufficient machining allowance as per drawing I as below or as per classification society recommendation. In case information is not clear the Drawing or TA, it is Firms responsibility to get the machining allowance from Classification Society.
- (a) Part of the rudder stock coming in contact with sea water is to be fitted with sleeves or any other approved and proven type coating.
- (b) The sleeves/coated areas are to be preserved with grease to protect from any mechanical damage during transportation. Soft wood packing is to be provided.
- 2.8 The bedding of the rudder stock to the tiller and bedding of palms will be done at firm's site. The final bedding, reaming and bolting (ie. between the rudder stock and rudder) has to be done at firm's site by firm and approved by classification society. The holes and the bolts are to be numbered for identification and correlation later on for assembly at site.
- 2.9 The details of the interfacing with the tiller including the depth of the interface should be to suit tiller. This interface with taper and keys is to be shown in firm's Drg (to be supplied along with the offer). The keys are to be supplied by firm.
- 2.10 Filling and draining of Rudder with Bituminous Solution will be done by OEM. Necessary plugs are to be provided for the same on rudder.



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- 2.11 Firms should confirm that all material will be procured with inspection certificate, material certificate (physical & chemical properties) and test certificate duly signed by Class.
- 2.12 Firm should procure the rudder stock with inspection certificate, material certificate (physical & chemical properties) and test certificate duly signed by Class.
- 2.13 All machined surfaces are to be properly preserved for storage and transport. Additional quantities of preservatives are to be provided for re-preservation after receipt inspection.
- 2.14 The firm should submit the Class approved QAP to MDL within four weeks of Placement of Order.
- 2.15 The rudder will have to be delivered with two coats of marine primer suitable for preservation upto one year in open weather condition.
- 2.16 Firm should prepare the fabrication /manufacturing drawing of rudder & rudderstock and get it approved from Class within two weeks of LOI and prior to manufacture.
- 2.17 Pair of 415V, 3Ph, 50 Hz solenoid valve rate controlled hydraulic power packs of adequate capacity(capacity to be indicated by firm with all necessary fittings providing desired rudder speed over 2 x 35 degrees when operated together /singly. Rate control should allow accurate rudder positioning without shock or overshoot. Supply should include electric motor, pump, coupling, relief valve, directional valve, rate control valve, filter with filter fail switch, low oil level sensor, high oil temperature sensor and hydraulic lock sensor. Special attention to be given to ensure silent operation of control unit, motors and pumps. The power pack should be supplied complete with oil & sea water resistant type of vibration mounts, foundation high tensile steel bolts with nuts, locknuts and washers.
- 2.18 Offer should include seawater to oil heat exchanger for operation in high ambient. Shell will be of M.S. seamless, end-cover of GM to BS 1400LG4C, tubes plates of 70:30 Cu-Ni.
- 2.19 Pair 415V, 3Ph, 50 Hz direct on line motor starters with local control and alarms. It should also provide termination for all sensors and alarms and extra alarm contacts for central alarm system.
- 2.20 One tiller puller.
- 2.21 Pair of combination radial, carrier (or suitable) bearings and packing glands for rudder stock diameter (size to be finalized by OEM as per Class rule requirement).
- 2.22 One duplicate rudder transmitter for rudder angle indicator it should also include limit switches for emergency local NFU steering by means of solenoid valve. Necessary interfaces should be provided for the steering gear equipment for satisfactory interfacing with auto pilot system.
- 2.23 One Motor Control and Alarm Panel for bridge having motor start I stop control, status for motor power available, control power available, motor run and visual and acoustic alarms for motor power fail control power fail, motor overload,



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phase fail, low oil level, high oil temperature, filter fail and hydraulic lock alarm and should meet classification rule requirements.

- 2.24 Rudder angle indicator, Motor running indication and interface with remote control system of above parameters in MCR.
- 2.25 One Local Control and Bridge Disconnect Panel providing local emergency steering control, rudder angle indication and local/ remote steering control selector it should also provide interface to steering control system, which has 24 VDC rate control output commands.
- 2.26 Electric manual steering switch in wheelhouse suitable for interface with non-follow up, follow up and auto pilot control fitted with rudder angle indicator, alarm control panel – 1no.
- 2.27 1no. feedback unit with cutout limit switch at 35 degree port and 35 degree starboard.
- 2.28 One hydraulic oil storage tank having adequate capacity along with all fittings to meet classification society rule requirements.
- 2.29 Complete pressurized grease lubrication arrangement if required to be indicated & covered in the offer.
- 2.30 Classification Society Approval for the entire steering gear system with all costs covered.
- 2.31 Note: Any item not listed above but required for satisfactory operation of the steering gear should also be provided by firm in consultation with auto pilot & feedback system supplier / manufacturer. Firm should undertake total system responsibility for steering gear.
- 2.32 Type approved equipment by IACS authority to be offered by the Vendor along with unit certification from both ABS & IRS Class.
- 2.33 If Type approval is not available with the equipment, class approved equipment to be supplied by the vendor (Class approval by IRS & ABS both).
- 2.34 Connectorisation of the delivered equipment and termination of the cable will be done by OEM onboard.
- 2.35 Interfacing of third party equipment/System and handshaking of data will be OEM's responsibility to prove system onboard.

### **3. Accessories:**

The Steering Gears are to be supplied with the following minimum accessories but not limited;

- 1) Gauges with isolating valves mounted on a panel.
- 2) Couplings / counter flanges for suction & discharge ends along with washers and fasteners.
- 3) Vibration Mounts along with fasteners.
- 4) Bellows and any other accessories & instruments required for satisfactory functioning of the Steering Gear system.
- 5) All nozzle/Connection should be provided with flexible Hose/Bellows. Flexible/Bellows to all the systems will be in supplier scope.





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6) Special tools (if any) required for the installation and maintenance.

#### **4. Instruments:**

Safety, control and monitoring devices are to be fitted on equipment as per requirement. All Miscellaneous items are to be fitted as per functional requirement of the system. All piping material with necessary instrument & accessories are to be fitted.

#### **5. Scope of Offer:**

The supplier to supply as a minimum the following information along with his technical offer:

- i. Type Approval certificate.
- ii. Technical Specification of the equipment.
- iii. GA drawing of all equipment, sub-assemblies along with piping connection details, weight, CG and maintenance space.
- iv. GA of control panel.
- v. Block diagram with cable interconnection along with cable schedule and connection schedule.
- vi. Cable drawing in autocad .dwg format
- vii. Inter-unit cabling diagram clearly indicating each unit/sub-unit and types of cables being used for the system.
- viii. Technical parameters of all equipment along with heat dissipation & accessories.
- ix. Detail Working principle/methodology
- x. Hydraulic system drawings & Electrical system drawings.
- xi. Instrumentation and alarm system diagrams.
- xii. Drawings and strength calculations for torque transmitting parts and parts subjected to internal hydraulic pressure.
- xiii. List of OBS with part nos. and special tools with part nos.
- xiv. Instrumentation List & Diagram.
- xv. Requirement of Greases, Oils etc, with their equivalents.
- xvi. List of equipment required for installation and operation of the equipment and not supplied by the manufacturer.
- xvii. List of accessories inclusive / not inclusive in the standard scope of supply.
- xviii. Proposed Quality Assurance & Quality Inspection Plan.
- xix. Details of standard and optional factory tests.
- xx. User list of similar equipment supplied by the manufacturer.
- xxi. List of previous supplies to Indian Coast Guard (Same Model).
- xxii. Delivery time from receipt of order.
- xxiii. Deviation form, Certificate of conformity & Weight control data attached with TSP sheet duly.



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## 6. Materials

All parts of the steering gear transmitting forces to the rudder and pressure retaining components of hydraulic rudder actuators are to be of steel, brass or other approved ductile material as per IR Class & ABS requirement. In general materials are not to have a tensile strength in excess of  $650 \text{ N/mm}^2$  ( $66 \text{ kgf /mm}^2$ ,  $94,300 \text{ psi}$ ).

Gray cast iron or other material having an elongation ( $L_0/d = 4$ ) less than 12% in 50 mm (2 in.) is not to be used for these parts.

Material Specification for Hydraulic Piping shall be as follows:

- A. Pipe: SS to AISI 304L
- B. Fittings: SS to AISI 304
- C. Valves: SS to AISI 304

Material for the closing plate and stool/ base structure of the steering gear, as required will be as per material of the ship's hull (ABS Grade B or equivalent shipbuilding material).

Material for Sleeve, Bushes - PB2 as per BS 1400(to meet ABS requirements).

**7. Safety Protection:** Mechanical as well as hydraulic means should be provided to lock the Rudder in Mid-ship position Firm should supply mid ship locking System. It should be possible to lock the rudder at any position hydraulically.

7.1 For each rudder, positive permanent rudder stopper at 37 degree should be provided.

7.2 Necessary relief valves should be provided for the actuator to relief the excess pressure to the suction side.

7.3 Built-in relief valve should be provided on the hydraulic pump itself.

7.4 Each relief valve is to be capable of relieving not less than 110% of the full flow of pump(s) which can discharge through it. With this flow condition, the maximum pressure rise not to exceed 10% of the relief valve setting taking into consideration increase in oil viscosity for extreme ambient conditions. Also the relief valve setting is to be at least 1.25 times the max. working pressure, but not to exceed the maximum design pressure.

## 8. Controls, Alarm /Indication & Instrumentation:

The electro-hydraulic steering gear will be controlled from Bridge. Operating indications of both the units shall be provided at main wheelhouse console, machinery control room, an in steering gear compartment.

### 8.1 Controls:

Control levers to be supplied as follows:

#### 8.1.1 Wheelhouse:

- 1) Two independent control levers for FFU (P&S).
- 2) One common steering wheel for FFU operation
- 3) Two independent control levers for NFU (P&S)



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### 8.1.2 Docking station

One common control lever for FFU operation in synchronized mode each on Port and Stbd wing station

The selector switch will be provided in Wheel House.

### 8.1.3 Steering compartment

Two independent control levers for NFU (P&S).

## 8.2 Controls and Instrumentations/Alarms are to be Interfaced with Integrated Bridge as per Class Rule. In this regard Firm should interact with IBS manufacturer.

8.3 There are to be two independent control systems provided, each of which can be operated from bridge. These control systems are to be independent in all respects and are to be provided in wheelhouse with all necessary apparatus and arrangements for the starting and stopping of steering gear motors and rapid transfer of steering power and control between units.

Also Rudder control and rudder angle indicators are to be provided for fitment on the Docking station (port & Stbd.) to meet NIBS or equivalent requirement

8.4 Main electric manual steering control suitable for interface with follow-up, non-follow-up modes shall be in wheelhouse.

8.5 Provision for steering non-follow - up mode should be provided both on the wheel house and steering gear compartment.

Emergency push buttons for steering, on pump units in steering gear compartment to be provided.

Emergency equipment in steering gear compartment should be provided as per class rule. Hand wheel and helm pump with necessary changeover valves to be supplied.

## **8.5 Alarms, Indications & Instrumentation:**

### **8.5.1 In Wheel House**

8.5.1.1 Steering wheel to be included along with the controls to be installed in wheelhouse. Joystick controls for operating the steering independently in NFU mode to be included on the control panel in wheel house.

Rudder control and rudder angle indicators are to be provided for fitment on the Docking station (port & Stbd.)

One alarm panel as a drop-in-plate (approx. size to be indicated) which will consist of minimum following to be supplied completely pre-wired.

8.5.1.2 Start/stop switches of both hydraulic pumps

8.5.1.3 Pump running/failure indication.

8.5.1.4 01 no. rudder angle indicator Panorama type

#### **8.5.1.5 Audio & visual alarm for.**

- i. Power failure
- ii. Phase failure
- iii. Motor Overload
- iv. Low oil level for steering gear hydraulic oil storage tank
- v. Low oil level for oil reservoir( header) of hydraulic power pack
- vi. Hydraulic oil pressure low
- vii. High Hydraulic oil temperature alarm



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- viii. Alarm acknowledgement
- ix. Alarm reset
- x. Dimmer

### **8.5.2 In MCR**

8.4.2.1 Audio Visual alarms indicated above for Wheel house are also to be provided in MCR.

Necessary signals to be provided for displaying the required parameters on multifunction work station IMCS.

#### **8.5.2.2 Audio visual alarms for:**

Necessary output signals to be provided for following audio visual alarms to be interfaced with remote control system. The parameters will be displayed on multifunction workstation.

- i. Power failure
- ii. Motor overload
- iii. Phase failure
- iv. Low oil level for steering gear hydraulic oil storage tank
- v. Low oil level for oil reservoir( header) of hydraulic power pack
- vi. Hydraulic oil pressure low
- vii. Hydraulic oil High temperature alarm
- viii. Alarm acknowledgement
- ix. Alarm reset
- x. Filter clogged alarm

8.5.2.3 Rudder angle indicator

**8.5.3 Trainee Bridge:** - Panorama type rudder angle indicator is to be provided.

8.6 Type of signal to be clearly indicated in the offer.

8.7 Alarms/indications should be provided for both pumps/motors.

8.8 Rudder angle indicator should consists of one transmitter fitted to the steering gear and two receivers mounted, one each at the Navigators position in the wheelhouse and MCR. Provision to be made in rudder angle indicator to accommodate the duplicate wire as duplicate wires will be run between wheelhouse and steering gear compartment. Failure of one indicator should not disable other indicators.

### **8.9 In Steering Gear Compartment**

- a. 01 no rudder angle indicator each, for port and stbd unit
- b. Mechanical rudder angle indicator is to be provided on each tiller arm.
- c. Pressure gauges with needle valve on both pump units
- d. Push button for emergency steering on pump units
- e. ACOS, Starter and Servo amplifier control panel
- f. DOL starter suitable for direct and remote operations complying with class rule requirements with following provisions incorporated there in.
  - i) Start/stop switch.
  - ii) Pump running/stop indications.
  - iii) Local/Remote switch.



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8.10 All the starter should be suitable for 415V, 3 Phase, 50 Hz power supply. Necessary arrangements should be provided to feed the control circuit of 230V, AC within starter. Starter panels to have auto change over switch for alternate supply. The supply available on the vessel is 415 V, 3 phase, 50 Hz /230 V, 1phase, 50 Hz and 24 V DC only.

8.11 Any other control/ instrument required as per classification rule but not mentioned above should be indicated in the offer & provided by firm.

## **9. MOTORS AND STARTERS**

9.1 Motors: The motors shall be selected so as to meet the relevant class rules. Enclosures of the motor shall be of IP-56 grade in the weather/exposed deck areas and of IP-44 grade for the machinery spaces/inside spaces. The motors shall have class “F” insulation. All motors weighting 20 Kgs and above shall be provided with lifting eye bolts. Weather deck motors shall have anti condensation heaters.

9.2 Starters & Controllers: The starters & controllers shall be totally enclosed marine type meeting class requirements. Starters for all motors less than 10HP shall have DOL type starter and star/delta starter shall be provided for motors of 10HP and above. Group starter panels shall be provided wherever applicable. Steering gear motor shall be provided as per Class requirement.

9.2.1 Starters shall be provided with the following components:-

- Push Buttons for Start/Stop
- Running Indication Lamps (LED)
- Overload Relay
- Single Phasing Protection
- Facility for Remote Start/Stop if required
- Suitable Terminals and Wiring, etc.

9.2.2 The enclosures of the starters/controllers shall be of the drip proof type (IP-44) in the machinery and all other spaces except the weather deck, where water tight enclosures (IP-56) shall be provided. The starters for domestic service motors shall be a composite part of the system to manufacturer’s standards.

9.2.3 Emergency stop push buttons for machinery room ventilating fans and fuel oil transfer pumps shall be located near the machinery room entrance or exit. Remote ON/OFF push buttons wherever needed to complete the operating system shall be provided as per the Class rules.

9.2.4 The starters should be suitable for 415V 3 phase, 50Hz, AC supply. However, 230 V control voltage required for the controls is to be derived from built-in step down transformer.

9.2.5 Equipment starter panel should be positioned ergonomically for access. All equipment, machinery, Distribution Boards (DBs), starter panels etc. should be provided with Anti Vibration Mount (AVMs). Junction boxes (JBs) in all areas including mast platform to be made accessible for maintenance and shall have minimum two spare ones. Only IP (Ingression Protection) 56 Polycarbonate JBs on spaces exposed to weather.

9.2.6 All motor including fractional HP motor shall be suitable for 415 volt, 3 ph, 50Hz AC/ 230V, 1Ph,50HZ supply except for COTS equipment/domestic equipment which will be to manufacturer’s standard. All motor shall have class F insulation and totally enclosed with minimum protection of IP 44 protection except for COTS equipment/domestic equipment which will be to manufacturer’s standard. Motor fitted on whether deck shall be of IP 56



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protection class and shall be provided with space heater. Interlock is to be provided on starter for switching of the space heater when motor is switched on. All motor weighing 20 kgs and above shall be provided with lifting eye bolt.

9.2.7 Name plate in English made from engraved brass (black) on weather deck and anodized aluminium (black) in other compartment, indicated motor rated starting current, full load current, rpm, class of insulation, rated voltage, rated running current, number of phase, number of pole, and frequency shall be provided.

9.2.8 The enclosures of the starters/controllers shall be of the drip proof type (IP-44) in the machinery and all other spaces except the weather deck, where water tight enclosures (IP-56) shall be provided. The starters for domestic service motors shall be a composite part of the domestic equipment system to manufacturer's standards.

The starters shall be suitable for 415V, 3 phase, 50Hz, AC supply or 230V, 1 Ph, 50 HZ supply depending on operating voltage of consumers

9.2.9 Mechanical construction:

The motor starter panel shall be made of 16 SWG MS sheet steel conforming to IS 2062. The panel to be power coated and of dead front type, enclosure class IP 44/IP 56 as required depending on location. The control panel shall be suitable for bulkhead mounting with necessary bolts, nuts, washers, spring shock mount, screw less terminal etc. The panel shall be provided with single hinged door with efficient locking device and door stoppers with neoprene gasket all round. It shall be suitable for front side maintenance support services. Size of the panel to be as small as possible considering space constraint on ship. Starter panel to be painted with polyester powder coating of RAL - 7032 paint.

## 10. Functional Characteristics:

The dimensional details of the rudder, percentage underwater area and disposition are to meet all requirements as per IR Class & ABS.

## 11. Technical Details

### 11.1 Rudder & Rudder Stock

- a. Rudder Stock with Bolted Palm of forged Steel meeting Class Requirement.
- b. Upper Carrier Bearing (meeting Class Rule)
- c. Rudder Trunk Pipe (meeting Class Rule) suitable for welding with ship's hull with Insert Plate and Brackets.
- d. Trunk Pipe Bush (GM or composite) (meeting Class Rule)
- e. Rudder Stock Liner (GM) In Way of Trunk Pipe Bush (meeting Class Rule).
- f. Bolted Type Rudder fabricated to Class Rule
- g. Fitted Bolts for joining Rudder with Rudder Stock (meeting Class Rule).
- h. Key for Coupling Rudder Stock with Tiller (meeting Class Rule).
- i. Necessary drawings are to be supplied along with Technical offer.

### 11.2 Rudder Actuator

Both the spade balance rudders should be fitted with necessary double acting cylinder with clevis bracket and pin. Foundation bolts of suitable material complete with nuts, lock nuts and washers should be supplied.

11.2.1 During ship's trial, the steering gear should be capable to undergo Full speed Trial & Half Speed trial.



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### **11.2.1. a Full Speed Trial (With Power Steering)**

Satisfactory performance is to be demonstrated under the following conditions:

Changing the rudder position from 35° on either side to 30° on the other side in not more than 28 seconds with the vessel running ahead at the maximum continuous rated shaft rpm. For controllable pitch propellers, the propeller pitch is to be at the maximum design pitch approved for the above maximum continuous ahead rated rpm.

### **11.2.1. b Half Speed Trial (With Emergency Steering)**

Satisfactory performance is to be demonstrated under the following conditions:

Changing the rudder position from 15° on either side to 15° on the other side in not more than 60 seconds while running at one-half of the maximum ahead speed or 7 knots whichever is the greater.

## **11.3 Hydraulic Power Pump Unit**

11.3.1 There should be two hydraulic power pumps to activate electro hydraulic steering gear. Both the hydraulic pumps should be capable of delivering full torque on each rudder area shall be approx. 5.64 m<sup>2</sup>. The rudder area given is tentative and the OEM should calculate the exact rudder area and torque based on the ship profile and also calculate the total lift. The pump unit should consist of power pump, solenoid operated manoeuvring valve, blocking valve, relief valve, oil header tank, Indicator for Oil level, oil level switches, filters, flexible coupling, flexible hoses, electric motor capable of starting automatically. The system should be designed such that in case of failure of one pump motor, another pump motor will start automatically.

11.3.2 Facilities should include remote start stop of the steering gear pumps from the wheelhouse console and local.

**11.4 Hydraulic Piping And Valve:** The hydraulic piping system should be so designed that after a single failure in the piping system or one of the power units , the defect can be isolated so that the integrity of the remaining parts will not be impaired and the steering capability can be maintained or speedily regained as per classification rule requirement

11.4.1 Necessary pipes/tubes of stainless steel AISI 304L, valves, double ferrule compression fittings, mating end connectors, flexible pipes, and other items as per Class Rule requirements should be supplied for satisfactory operation of the complete steering gear system on-board.

## **11.5 Hydraulic Oil:**

11.5.1 Type of oil specification and total quantity of oil required for the system to be indicated by the firm.

11.5.2 One no semi-rotary hand pump is to be provided for from the hydraulic oil storage tank to individual hydraulic power packs.



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11.5.3 The capacity of the hydraulic storage tank will be such that it caters for one time change of oil for the complete system.

**11.6 Power Gear Stops:** The steering gear is to be fitted with arrangements, such as limit switches, for stopping the gear before the structural rudder stops or positive mechanical stops within the steering gear are reached. These arrangements are to be synchronized with the rudder stock or the position of the gear itself and may be an integral part of the rudder actuator. Arrangements to satisfy this requirement through the steering gear control system are not permitted.

**11.7** Oil seals between non-moving parts forming part of the exterior pressure boundary are to be of the metal upon metal type or of an equivalent type. Oil seals between moving parts forming part of the external pressure boundary are to be fitted in duplicate so that the failure of one seal does not render the actuator inoperative. Alternative seal arrangements may be acceptable provided equivalent protection against leakage can be assured.

**11.8 Hydraulic Locking :** Hydraulic locking to be provided as per ABS & IR Class.

**11.9 Hydraulic Oil Reservoir and Storage Tank:** A fixed hydraulic oil storage tank independent of the reservoir is to be provided. The storage tank is to have capacity as per IR Class & ABS requirement. The tank is to be permanently connected by piping in such a manner that the system can be readily recharged from a position within the steering gear compartment. The storage tank is to be provided with an approved level indicating system.

**11.10 Hull Cartridge:** Relevant part of hull lines will be provided by shipyard to OEM for fabrication of the hull unit. Shell plate to be provided by OEM. The hull unit will be duly provided with reference marking for welding of the same with the hull by shipyard. OEM will recommend/ prescribe welding sequence of the hull unit to shipyard for distortion free welding of the hull unit.

### **11.11 Power Units**

The steering gear is to be composed of two identical power units, provided that

- a) Steering system is to be capable of putting the rudder from 35° on one side to 35° on the other side with the vessel running ahead at the maximum continuous rated shaft rpm and at the summer load waterline and, under the same conditions, from 35° on either side to 30° on the other side in not more than 28 seconds.
- b) The main steering gear is arranged so that after a single failure in its piping system or in one of the power units the defect can be isolated so that steering capability is regained.

Power units are to be

- a) Arranged to re-start automatically when power is restored after a power failure.





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- b) Capable of being brought into operation from any of the steering positions. In the event of a power failure to any one of the steering gear power units, an audible and visual alarm is to be given at each steering position.
- c) Arranged so that transfer between units can be readily affected.

### 11.12 Cables

All cable assemblies required are to be supplied in prepared condition along with the installation material/ main equipment, and length of each cable to be indicated. All cables required to interconnect the steering gear system equipment, sub-system equipment, OEM cables etc shall be of LFH type & shall be supplied by the firm. The power supply cables should be of EBXL type and signal cables should be of LFH type. For all interconnecting cables, list of types of cables used along with detailed specification of each type of cable to be indicated. Cable length restrictions if any are to be indicated in the offer. The type/ pattern no of interface cables (connecting to other system), OEM/suppliers' cables etc. to be indicated in the offer. The tentative quantities of end connectors are also to be indicated in offer.

11.12.1 Firm to consider all cables required to complete the system configuration and quote for adequate quantities required. Any inadequacy in supplied cables vis-à-vis actual requirement onboard observed thereafter shall be made good by the firm without any cost implications.

11.12.2 All the cable should be LFH type.

**11.13 Power Supply:** Steering Gear is to be supplied with power supply from both the main and alternate source of electrical power with type tested automated changeover switch capable to switch over from Normal to Alternate power supply and vice versa. The Steering Gear shall operate on ship's main power supply for input power supply to the system. Further, all other secondary supplies required for the system operation are to be derived from the main input power supply. 230V, 50Hz, 3Ph supply will be provided as normal and alternate supply input to the auto changeover switch supplied by Steering Gear vendor.

**11.14 Local Steering Gear Control:** Local steering gear control is to be provided in the steering gear compartment. For the purpose of local control from the steering gear compartment (or the space containing the power unit), a means is to be provided in the steering compartment (or the space containing the power unit) to disconnect any control system from the navigation bridge. Such means for disconnecting are to be operable by a single person without the need for tools. Additionally, if more than one steering station is provided, a selector switch is to disconnect completely all stations, except the one in use.

**11.15 Power Supply Feeder:** Electrohydraulic steering gear is to be served by at least two exclusive circuits, fed directly from the main switchboard; however, one of



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the circuits may be supplied through the emergency switchboard. Each of duplicated power units required is to be served by one of these circuits. The circuits supplying an electrohydraulic steering gear are to have adequate rating for supplying all motors, control systems and instrumentation which are normally connected to them and operated simultaneously. The circuits are to be separated throughout their length as widely as is practicable

**11.16 Steering Mode Selector Switch:** If a joint steering mode selector switch (uniaxial switch) is employed for both steering gear control systems, the connections for the circuits of the control systems are to be divided accordingly and separated from each other by an isolating plate or by air gap.

**11.17 Undervoltage Release:** Power unit motor controllers and other automatic motor controllers are to be fitted with under voltage release (capable of restarting automatically when power is restored after power failure).

**11.18 Follow-up amplifier:** In case of double follow-up control, the amplifiers are to be designed and fed so as to be electrically and mechanically separated. In the case of non-follow-up control and follow-up control, the follow-up amplifiers are to be protected selectively.

**11.19 Feed-back Units and Limit Switches:** The feed-back units and limit switches, if any, for the steering gear control systems are to be separated electrically and mechanically connected to the rudder stock or actuator separately.

**11.20 Hydraulic Control Components:** Hydraulic system components in the power actuating or hydraulic servo systems controlling the power systems of the steering gear, (e.g. solenoid valves, magnetic valves,) are to be considered as part of the steering gear control system and shall be duplicated and separated.

11.19.1 Hydraulic system components in the steering gear control system that are part of a power unit may be regarded as being duplicated and separated when there are two or more separate power units provided and the piping to each power unit can be isolated.

**11.21 System Response under Failure:** The failures likely to cause uncontrolled movements of rudder are to be clearly identified as per ABS & IR Class. In the event of detection of such failure, the rudder is to stop in the current position without manual intervention or is to return to the midship /neutral position. Failure Mode and Effect Analysis methodology may be used to identify the failures. For mechanical failures such as sticking valves and failure of static components (pipes, cylinders), the system response without manual intervention is not mandatory, and the operator can follow instructions on the signboard in case of such failures.

**11.22 Control Power Supply**



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If the control systems operable from the navigation bridge are electric, then each system is to be served by its own separate circuits supplied from a steering gear power circuit in the steering gear compartment, or directly from the switchboard bus bars supplying that steering gear power circuit at a point on the switchboard adjacent to the supply to the steering gear power circuit.

11.21.1 Circuits supplying power to steering gear controls are to be provided with short-circuit protection only.

### **11.23 Autopilot**

- (a) Steering gear systems provided with an autopilot system are to have a device at the primary steering station to completely disconnect the autopilot control to permit change over to manual operation of the steering gear control system. A display is to be provided at the steering station to ensure that the helmsman can readily and clearly recognize which mode of steering control (autopilot or manual) is in operation.
- (b) In addition to the changeover device as above, for primary steering stations, where fitted with an automatic autopilot override to change over from autopilot control to manual operation, the following are to be provided.

An audible and visual alarm is to be provided at the primary steering station in the event that:

- i. The automatic autopilot override fails to respond when the manual helm order is 5 degrees of rudder angle or greater, and
- ii. It is immediately activated upon automatic autopilot override actuation.

The alarm is to be separate and distinct from other bridge alarms, and is to continue to sound until it is acknowledged.

### **11.24 Instrumentation**

Instruments for monitoring the steering gear system are to be provided as per IR Class & ABS. All alarms are to be audible and visual and are to be of the self-monitoring type so that a circuit failure will cause an alarm condition. There are to be provisions for testing alarms.

### **11.25 Communications**

A means of communication is to be provided between the navigation bridge and the steering gear compartment including all other locations where steering can be effected. Additionally, communication is to be provided between these spaces and the main propulsion control station.

**11.26 Electrical Designation and Marketing.** All power, lighting, electronic, communication, weapon, other electric equipment and cables shall be designated or marked in English numerals as per standard practice. For identification of each core, marked ferrules is to be provided at both termination ends. Wherever applicable colour coded cables shall be used. All permanently installed cables are to be tagged



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as far as practicable to each point of connection. Cable identification shall be arranged as per MCT cable gland suppliers system.

## **12. Installation, Tests and Trials:**

### **12.1 Steering Gear Seating**

Steering gears are to be bolted to a substantial foundation effectively attached to the hull structure. Suitable chocking arrangements are to be provided to the satisfaction of the Surveyor.

### **12.2 Operating Instructions**

Appropriate operating instructions with a block diagram showing change-over procedures for steering gear control systems and steering gear power units are to be permanently displayed on the navigation bridge and in the steering gear compartment. Where failure alarms are provided to indicate hydraulic locking, instructions are to be permanently posted on the navigation bridge and in the steering gear compartment for the operator to shut down the failed system.

### **12.3 Installation Tests**

After installation on board the vessel, the complete piping system, including power units, rudder actuators and piping is to be subjected to a hydrostatic test equal to 110% of the relief valve setting, including a check of the relief valve operation in the presence of the Surveyor.

### **12.4 Sea Trials**

The steering gear is to be tried out on the trial trip in order to demonstrate to the Surveyor's satisfaction that the requirements of this section have been met. The trials are to be performed with the rudder fully submerged. Where full rudder submergence cannot be obtained in ballast conditions, steering gear trials are to be conducted at a displacement as close as reasonably possible to full-load displacement as required by Section 6.1.2 of ISO 19019:2005 on the conditions that either:

- i. The rudder is fully submerged (zero speed waterline) and the vessel is in an acceptable trim condition.
- ii. The rudder load and torque at the specified trial loading condition have been predicted (based on the system pressure measurement) and extrapolated to the full load condition as per IR Class & ABS.
- iii. Alternatively the designer or builder may use computational fluid dynamic (CFD) studies or experimental investigations to predict the rudder stock moment at the full sea going draft condition and service speed. These calculations or experimental investigations are to be to the satisfaction of IR Class and ABS.

In any case for the main steering gear trial, the speed of ship corresponding to the number of maximum continuous revolution of main engine and maximum design pitch applies.



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## Annexure - 1

### GENERAL POINT FOR MOTORS AND STARTERS

#### 1. Motors.

- (a) Motors shall be suitable for marine use and conform to latest classification rules of American Bureau of Shipping (ABS) / Indian Register of Shipping classification requirements.
- (b) Motors shall be of standard squirrel cage continuous rated induction type.
- (c) All Motors including Fractional HP motors shall be suitable for 415 Volts, 3 phase, 50 Hz AC supply.
- (d) All Motors shall have class 'F' insulation and totally enclosed with minimum protection of IP-44.
- (e) Motors fitted on the Weather Deck shall be of IP-56 and shall be provided with anti-condensation heaters.
- (f) All motors of 50HP/37.5 KW and above shall be provided with space heaters.
- (g) Interlock is to be provided on starter for switching off the space heater when the motor is switched ON.
- (h) All motors weighing 20 Kgs, and above shall be provided with lifting eyebolts.
- (i) Name plate in English made from engraved brass(black) on weather deck and anodized aluminium (black) in other compartments, indicating motor rated starting current, full load current, rpm, class of insulation, rated voltage, rated running current, number of phases, number of poles and frequency shall be provided.

#### 2. Cable Connections.

- (a) The electric cables shall enter the terminal box on the motor through glands, cable glands to be supplied alongwith the motor.
- (b) Crippage distance of 20mm space for connecting the cables inside the terminal box should be provided.

#### 3. General.



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- (a) All motors of 13.5 HP/10 KW & above shall be provided start-Delta Starters or soft starters.
- (b) Motors below 13.5 HP/10 KW shall be provided with direct on-line starters.
- (c) Fractional HP motors shall be provided with suitable MCCBS/MCBs only.
- (d) Starters to have current protection.
- (e) Starters shall be provided with under voltage protection for motors above/ HP.

4. **Electrical Supply.**

- (a) The starter shall be suitable for 415 Volts, 3 Phase, 50Hz Ac supply.
- (b) The starter shall be provided with Triple Pole Isolator Rotary type incomer.
- (c) MCB/ MCCB.
- (d) ON and OFF Push Buttons.
- (e) Control fuses.
- (f) Motor 'ON' LED indication for Local and remote(As applicable).
- (g) Provision for Auto ON/OFF facility(As applicable).
- (h) Electronic external/separate single phasing preventer to be provided to protect all the three phases of the motors rates 13.5 HP/10KW and above.
- (j) Provision for remote ON-OFF Facility.
- (k) Spare NO/NC contacts for interfacing as required to be provided.
- (l) KED indications with tallies for the following fault condition to be provided.
- (m) Single phasing.
- (n) Overload.
- (p) Thermister Over Heating, if applicable.
- (q) Contactor with two potential free contacts(spare).



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- (r) Timer applicable.
- (s) Over Load Relay (85 to 150%).
- (t) Provision of connecting anti-condensation heater/ space heater.

**6. Thermister and overload Protection.**

- (a) The motor thermal protection system in the starter must detect the abnormal rise in temperature by means of positive temperature co-efficient thermistors (PTCT). Motor should trip due to rise in temperature.
- (b) Timer.
- (c) It should have wide operating range, repeated accuracy and wide time setting.
- (d) Electronic timers should be provided for Star-Delta application.
- (e) Thermal timers to be provided for over lead protection.

**7. Mechanical Construction.**

- (a) The motor starter panel shall be made of 14 SWG Aluminium construction conforming to (A5083 Hill or H 112 or H 116) or (A5086 Hill or H 112 or H 116) or 16 SWG MS Sheet Steel confirming to IS-2026. The panel and assemblies are to be reinforced to withstand the mechanical, electrical (Magnetic) and thermal stresses likely to be encountered in service and are to be protected against corrosion. The panel to be power coated and of dead front type.
- (b) Control Panel fitted on the weather deck shall be made of non-magnetic 16 SWG mat finish stainless steel conforming to IS-316 with IP-56 protection.
- (c) The control panel shall be suitable for bulkheads/in-built eqpt mounting with necessary bolts, nuts, washers, spring – shock mount, screw less terminals etc.
- (d) Suitable locking device will be provided for fixing screws and bolts for preventing them from loosening.
- (e) The panel shall be provided with single hinged door with efficient locking device and door stoppers with Neoprene gasket all around. It shall be suitable for front side maintenance support services.



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(f) The bottom plate shall be of removable type for cable entry through cable glands.

(g) Size of panel to be as small as possible considering space constrains on ship.

#### 8. **Cable Connections.**

(a) The electric cable shall enter the panel from bottom through glands, cable size will be indicated by MDL for supply of cable glands.

(b) The screw less connecting terminals shall be positioned at the bottom of the panel, with all the internal wiring terminated on one side.

(c) Crippage distance of 20mm space for connecting the cables inside the panel should be provided.

(d) 10% spare terminals to be provided.

(e) All electrical supports inside the starter panel shall be of high quality and moisture resistant materials. The contact surfaces and studs of all devices, to which electrical connections are made, shall be tinned.

#### 9. **Internal Wiring.**

(a) The Internal wiring shall be made by using LFH type copper multi-stranded conductor flexible cables of adequate rating with minimum 1.5 sq. mm. size and has to be neatly dressed and bunched.

(b) All control and auxiliary wirings shall be provided with numbered ferrules at both the ends for easy identification.

(c) A laminated circuit diagram plate to be provided inside the panel at appropriate place. Suitable earthing to be provided for earthing the panel with the ship hull.

#### 10. **Name Plate.**

(a) Name plate in English made from anodized aluminium (black) shall be provided for all devices in the panel to identify their function.

(b) Component tallies shall be provided for all the components inside the starter panel.





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(c) Operating voltage tally shall be provided on the front top. Operating voltage tally shall be in red letters.

11. **Painting Scheme.**

(a) Starter Panel to be painted with Polyester power coating of RAL-7032 paint.

12. **Spares.**

(a) Standard spares for unrestricted service meeting the classification should be included in the scope of supply and the list of such spares with Part/Pattern number and quantity in numbers are to be furnished in the offer. These spares are to be supplied as a part of the equipment.

13. **Binding Drawings/Documentation.**

(a) General arrangement Drg. Of Motors and Starters including weight and dimension.

(b) Internal Wiring Diagram.

(c) Calibration Certificate for timers, Thermisters and Overload relays as applicable.

14. **Trials.**

(a) Acceptance of Motors and Starters will be Subject to Satisfactory Results of Performance tests and routine tests. The tests data offered during Performance tests of Motors in Factory Premises to be documented and forwarded to GSL, as part of the Documentation.

(b) Tables of Relay Ranges, Fuses, MCBs, MCCB, Timers & SPP for Motor Protection.



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**Annexure - 2**

**DEVIATION LIST**

The Supplier shall fill in this form for the deviations of their bid from the requirements as stated in the Material Requisition. If no deviation is required Supplier shall fill in "NIL" in the 'Deviation column. Supplier shall sign/date and affix their company seal.

SR. No.	DOCUMENT No./ CLAUSE No.	REQUIREMENT	DEVIATION WITH REASONS	CGHQ / MDL REACTIONS

**SUPPLIER’S COMPANY SEAL DATE** **SUPPLIER’S SIGNATURE &**

**A-ACCEPTED N-NOT ACCEPTED C-CONDITIONAL ACCEPTANCE (SEE ATTACHED SHEET)**





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**Annexure - 3**

WEIGHT CONTROL DATA SHEET																			
EQUIPMENT DESCRIPTION		EQUIPMENT NO.																	
COMPARTMENT		LOCATION																	
SWBD : <input type="checkbox"/> TOLERANC E CODE <input type="checkbox"/> PRELIMINAR Y EST. <input type="checkbox"/> DESIGN EST. <input type="checkbox"/> M.T.O (CALC) <input type="checkbox"/> WEIGHED <input type="checkbox"/> TOLERANCE ± %																			
<b>1. WEIGHT (Kg.)</b>																			
(a)	DRY	Kg ±	%																
(b)	FLUID	Kg ±	%																
(c)	OPERATING	Kg ±	%																
(d)	TEST	Kg ±	%																
(e)	TOTAL	Kg ±	%																
<b>2. EQUIPMENT DIMENSIONAL DATA (mm) &amp; Co-ordinates of CoG</b>																			
<p style="text-align: center;"><b>PLAN</b></p> <p style="text-align: center;"><b>ELEVATION</b></p>	<p style="text-align: center;"><b>PLAN</b></p> <p style="text-align: center;"><b>ELEVATION</b></p>	<p style="text-align: center;"><b>PLAN</b></p> <p style="text-align: center;"><b>ELEVATION</b></p>																	
<table border="1" style="margin: auto;"> <thead> <tr> <th colspan="2">OVERALL SIZE</th> <th colspan="2">CENTRE OF GRAVITY</th> </tr> </thead> <tbody> <tr> <td>'A'</td> <td></td> <td>'X'</td> <td></td> </tr> <tr> <td>'B'</td> <td></td> <td>'Y'</td> <td></td> </tr> <tr> <td>'C'</td> <td></td> <td>'Z'</td> <td></td> </tr> </tbody> </table>		OVERALL SIZE		CENTRE OF GRAVITY		'A'		'X'		'B'		'Y'		'C'		'Z'			
OVERALL SIZE		CENTRE OF GRAVITY																	
'A'		'X'																	
'B'		'Y'																	
'C'		'Z'																	
NOTE : • ALL OFFERS SHALL INCLUDE THIS DATA SHEET DULY FILLED IN BY THE SUPPLIER (SIGNED, DATED & SEAL AFFIXED). • ALL FINISHED ITEMS SHALL BE WEIGHED & A CERTIFICATE SHALL BE PROVIDED AS PER ATTACHED SHEET. • SEPARATE SHEETS SHALL BE COMPLETED FOR EACH INSTALLED EQUIPMENT. • ORIGIN OF 'X', 'Y' AND 'Z' TO BE INDICIATED.																			
<b>SUPPLIER'S SEAL</b>		<b>SUPPLIER'S SIGNATURE &amp; DATE</b>																	



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**Annexure - 4**

**WEIGHT CERTIFICATE**

**EQUIPMENT DESCRIPTION:**

**EQUIPMENT NO. :**

The form shall be completed by Supplier & shall be supplied along with the equipment.

**SUPPLIER'S NAME**

**ADDRESS**

**TELEPHONE NO.**

**ORDER NO.**

**Ref. Drg. No.**

**Part No.**

**EQPT. NO.**

**METHOD OF WEIGHING:**

Supplier shall prescribe Method & Equipment Used:

**DATE OF LAST CALIBRATION**

**SPECIFIED ACCURACY REQUIREMENT**

**NOTE :-**

**RESULT OF WEIGHING TOTAL EQUIPMENT DRY WEIGHT**

(Excluding packing, temporary protection etc.)

**ALLOCATED WEIGHT**

(Weight estimate agreed by purchaser and supplier based on order specs).

**REASONS FOR VARIATION BETWEEN ALLOCATED WEIGHT AND CERTIFIED WEIGHT:**

**WEIGHING ADDRESS:**

**WITNESSED BY**

**FOR SUPPLIER**

**FOR PURCHASER**

**Representative**

**Representative**

**Date:**

**Signature / Date & Seal**

**Signature/Date & Seal**



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**Annexure - 5**

<b>Compliance Matrix</b>					
<b>EQUIPMENT DESCRIPTION:</b>			<b>EQUIPMENT NO. :</b>		
The form shall be completed by Supplier & shall be supplied along with the equipment.					
<b>SUPPLIER'S NAME</b>				<b>Ref. Drg. No.</b>	
<b>ADDRESS</b>				<b>Part No.</b>	
<b>TELEPHONE NO.</b>					
<b>ORDER NO.</b>				<b>EQPT. NO.</b>	
S No.	Tender Specifications Para reference	Brief Description as per Relevant Tender Specifications	Compliance to Tender Specifications	Deviations if any, with Reasons	Remarks if any
<b>SUPPLIER'S COMPANY SEAL</b>			<b>SUPPLIER'S SIGNATURE &amp; DATE</b>		



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## **ANNEXURE - 6**

### **Checklist with offer:**

The supplier to supply as a minimum the following information along with his technical offer:

- 1) Technical Specification of the equipment.
- 2) Type approval certificate (If any).
- 3) Details of all connections to equipment, Vibration details with pattern no, seat details, flange details etc.
- 4) GA drawing of all equipment's, sub-assemblies & accessories.
- 5) Technical parameters of all equipment & accessories.
- 6) Outline drawings of the equipment indicating overall dimensions, C.G. and Maintenance envelope.
- 7) P & ID and E&ID diagram.
- 8) Complete Weight breakdown (excluding & including oil).
- 9) Heat dissipation of the Equipment
- 10) Details of other ship services required.
- 11) Tools required for maintenance.
- 12) Recommended onboard and base spares holding (for 3 year and 5 years operation respectively)
- 13) Manufacturers list of spares for installation & Commissioning.
- 14) Instrumentation List & Diagram.
- 15) Brief on integration of Steering Gear Control System with ship's Integrated Control System.
- 16) Inter-unit cabling diagram clearly indicating each unit/sub-unit and types of cables being used for the system.
- 17) Requirement of Greases, Oils etc., with their equivalents.
- 18) Proposed factory tests and Inspection plan.
- 19) Proposed preservation plan.
- 20) Delivery time from receipt of order.
- 21) Clear demarcation between the scope of supply of firm and that of the yard.
- 22) List of equipment required for installation and operation of the equipment and not supplied by the manufacturer.
- 23) Trial and commissioning time of complete system on board.
- 24) Special tools and test equipment to be supplied for on board maintenance.
- 25) List of main equipment included in the standard scope of supply.
- 26) List of accessories inclusive / not inclusive in the standard scope of supply.
- 27) List of tools & accessories required for installation & commissioning
- 28) Reliability parameters.
- 29) User list of similar equipment supplied by the manufacturer.
- 30) Details of standard and optional factory tests.

### **MOTOR:**

- 1) Service
- 2) Type of motor
- 3) Power supply – Voltage, Frequency & No. of phases



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- 4) Output of motor
- 5) RPM (No load and full load)
- 6) No. of poles
- 7) Full load current
- 8) Starting current
- 9) Starting torque when the ambient temp. is 30oC
- 10) Pull out torque
- 11) Run up time
- 12) Motor Enclosure & Protection provided
- 13) Noise & Vibration level
- 14) Class of insulation
- 15) Method of starting – Remote, local facility & indication
- 16) Type of winding
- 17) Weight of the motor
- 18) Over all dimensions of the motor
- 19) Terminal connection detail
- 20) Efficiency at 100%, 75% & 50%
- 21) Power Factor at 100%, 75% load
- 22) Direction of rotation
- 23) Shaft material
- 24) Lifting arrangement of motor
- 25) Whether RIS unit provided
- 26) Whether heaters are fitted and supply voltage to heater is indicated
- 27) Whether heater supply required
- 28) Frame size
- 29) Method of mounting
- 30) Serial no of machine
- 31) Duty cycle (period of output)
- 32) Particulars of shaft end
- 33) Heat dissipation

**STARTER:**

- 1) Service
- 2) Type of starter
- 3) Voltage, frequency and No. of phases
- 4) Protection provided
- 5) Enclosure
- 6) Vibration level
- 7) Method of mounting and requirement of mounts
- 8) Method of starting, remote and local control
- 9) Facilities and indication provided.
- 10) Weight and overall dimensions of the equipment
- 11) Rating of the contactors
- 12) Spares provided
- 13) Class of insulation



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**Annexure - 7**

**MANUFACTURER'S RECOMMENDED LIST OF SPARES TOOLS AND SOFTWARE (MRL-OBS)**

**VESSEL/ EQUIPMENT: 01 TRAINING SHIP**

Sr No	Eqpt Part No./ Model no./SI No.	Eqpt Description	OEM Name	Vendor Name	Illustrated Spare Part List (ISPL) Reference/ Part No. of	Desc of Spare	Country of Origin	Unit Price	Seller Order No. & Date	Currency Code	Total Qty	VED* Category	Recommended scale for 01 Training Ship	Remarks

**MANUFACTURER'S RECOMMENDED LIST OF SPARES (MRL-B&D)**

**VESSEL/ EQUIPMENT: 01 TRAINING SHIP**

Ser No	Eqpt Part No./ Model no./SI No.	Eqpt Description	OEM Name	Vendor Name	Illustrated Spare Part List (ISPL) Reference/ Part No. of Spare	Desc of Spare	Country of Origin	Unit Price	Seller Order No. & Date	Currency Code	Total Qty	VED* Category	Recommended scale for 01 Training Ship	Remarks

\*VED- VITAL / ESSENTIAL/ DESIRABLE analysis of spares to be carried out by OEM prior to submission to the Buyer.  
 Original Equipment Manufacturer (OEM): \_\_\_\_\_ (Complete Address)





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1. Data regarding maintenance spares/stores like lubricants, sealing compound, gases should be given separately giving source of supply.
2. Data furnished as OBD and B&D should also include software backups, as applicable
3. In “Remarks” column following information (if applicable) be given:-
  - a) If an item has a shelf/operational life it will be marked as ‘G’ and life be indicated
  - b) Matching set of components be indicated.
  - c) Item which can be locally manufactured in India should be marked ‘LM’.
  - d) Items which cannot be manufactured in India due to sophisticated design/ technology may be marked as ‘SI’ (Special Item).
  - e) If a component/assembly is common to other similar equipment offered by the OEM earlier, these should be marked ‘CM’ and Name of the equipment be indicated.
4. OBS and B&D spares list should be drawn out of the ‘Part List’ of the equipment, which should be separately given as part of Technical Manuals.
5. If the main equipment consists of other equipment, then OBS and B&D spares list should be prepared for them under proper heads. OBS and B&D spares list is to be prepared as per the maintenance concept of the customer.
6. Items provided along with the equipment as spares should also be included in OBS and B&D list
7. Modules/ Shop Replaceable Unit (SRU) / assemblies should be listed and their components should be included under them so as to relate each item of spare to their module / SRO / assembly.
8. OBS and B&D list for test equipment should also be provided on the similar format.
9. Cost to be indicated in Price bid only.



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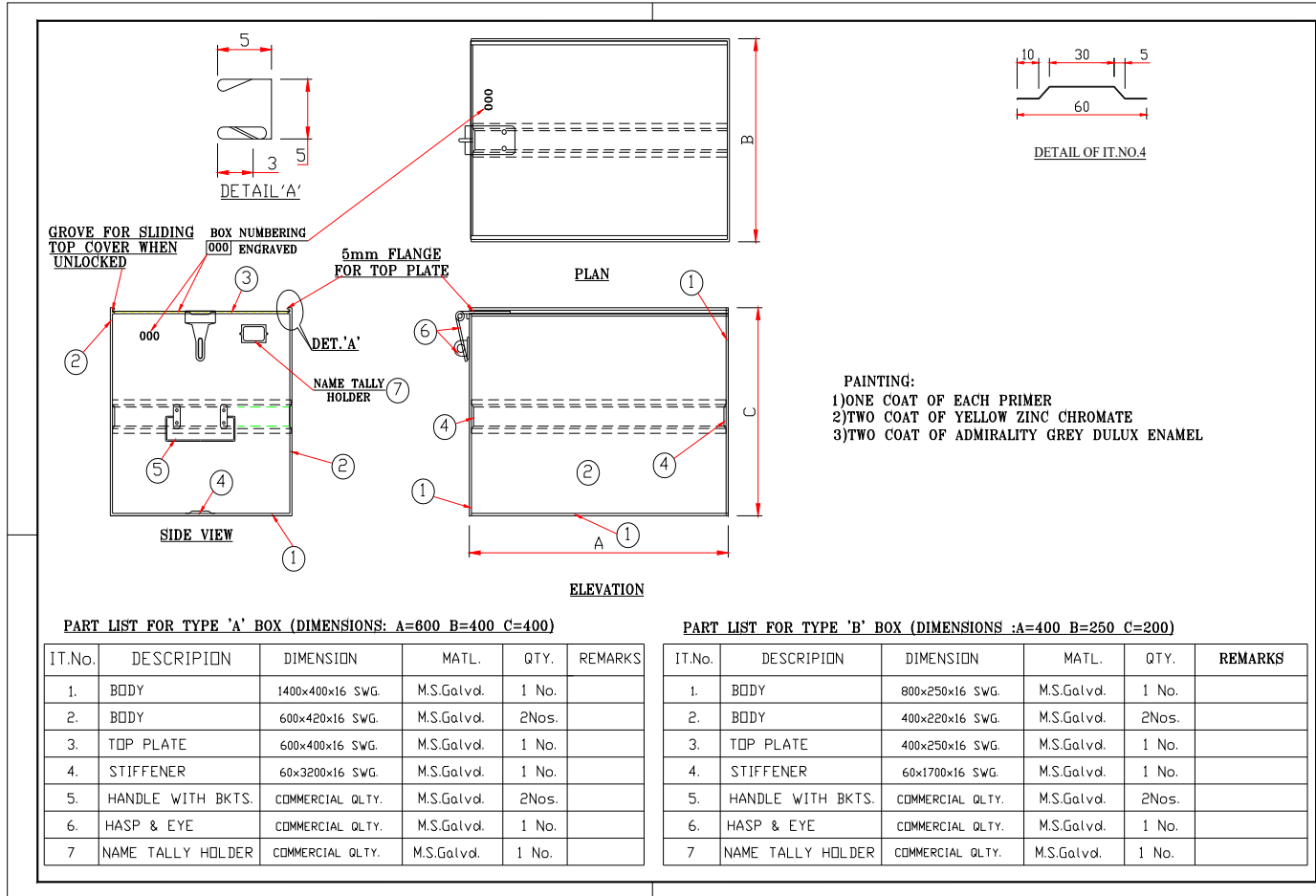
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**Annexure - 8**  
**REFERENCE DRAWING FOR SPTA BOX**



*[Handwritten signature]*



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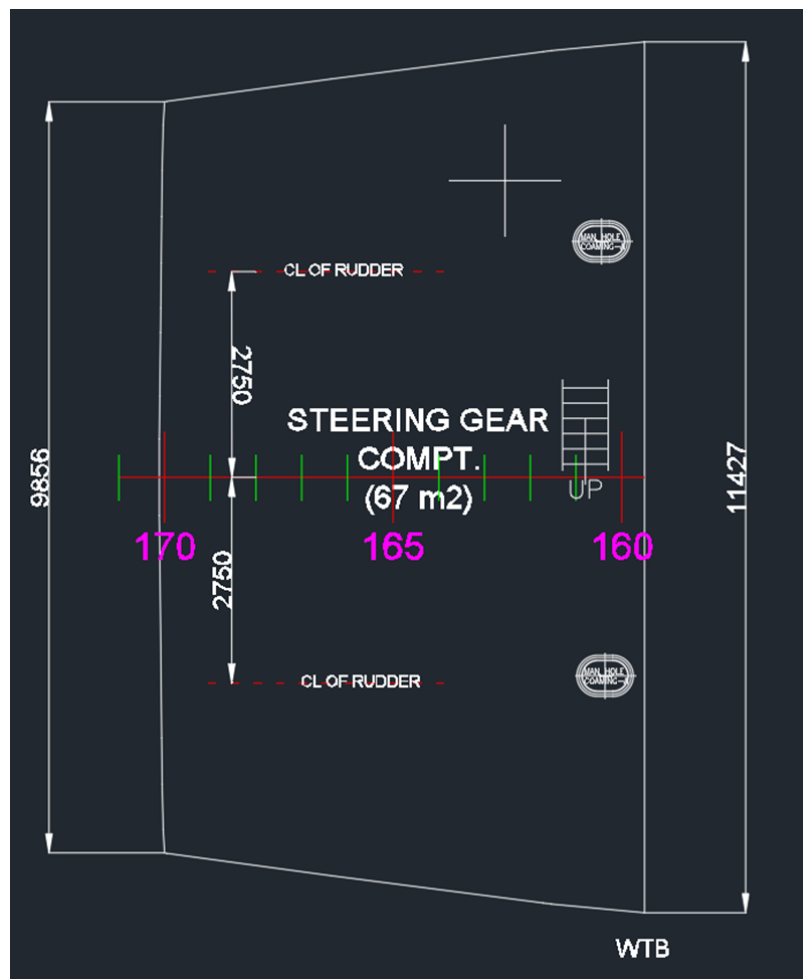
<b>DESIGN ENGINEERING</b>	<b>SOTR No.</b>	<b>3008</b>
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**Annexure - 9**  
**Maintenance Management Software (MMS) format**

Maintenance Interval Schedule	Tasks to be performed	Detailed task description with corresponding equipment image in PDF/ jpeg format	Spares required for performing the tasks			Tools required
			Description	Quantity	Dimension/ weight	
Example:						
Initial 500 Hours	Aux water pump inspect	Check following components for wear and damage 1)Bearings 2)Impeller 3)Seal	Nil	Nil	Nil	1) 1U-7546 chain wrench 2)Engine standard tool kit
	Battery electrolyte level check	1)remove filler caps 2)Add only distilled water if necessary 3)Keep the battery clean 4)clean the terminals with fine grade of sandpaper if required.	Distilled Water	Nil	Nil	
	Engine oil filter change	1)Remove oil filter with 1U-7546 chain wrench 2)Clean sealing surface of filter mounting. 3)Apply clean engine oil to new oil filter gasket 4) intall the new oil filter. Tighten the filter until filter gasket contacts the base. Do no overtight the oil filter.	2) Oil filter gasket	1	Nil	



**Annexure - 10**  
**STEERING COMPARTMENT (FOR REFERENCE)**



**ALL DIMENSIONS IN MM**



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**Annexure - 11**

**TIMELINES FOR TASKS AND DELIVERABLES (DURATIONS) OF STEERING GEAR**

FOR MDL				
Activity	Yard 16101			
	From	To	Duration (Weeks)	
<b>Placement of order</b>	<b>P</b>			
1 Binding Data	P	P+3	03	
2 QAP	P	P+4	04	
3 Manufacturing Drawing	P	P+3	03	
4 FAT & Certification	E-12	E-4	08	
<b>5 Equipment Supply</b>	<b>E</b>			
<b>6 Documentation</b>	<b>As per SOTR</b>			
7 Preservation	<b>As per SOTR</b>			
(a) In Stores <b>OR</b>				
(b) On- board				
<b>8 Services of Engineers</b>	<b>As per SOTR</b>			
(a) Installation				
(b) STW				
(c) HATs				
(d) SATs				
(e) For Routines				
(f) Training				
9 OBS for two years	<b>As per SOTR</b>			
10 Warranty				
11 B&D Spares	<b>As per SOTR</b>			

\* - These end dates will be indicated as calendar dates in the Purchase Order.

P- Placement of Purchase Order, E- Equipment Delivery, D- Planned Delivery

**Above timelines are tentative, subject to change.**



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**Annexure - 12**

**CABLE FORM LIST**

SR NO	CABLE NO	CABLE PATTERN NO	CABLE SPEC DESCRIPTION	FROM UNIT	TO UNIT	OD	LENGTH	ANY SPECIFIC INSTRUCTIONS FOR CABLE LAYING





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**Annexure -14**

**TABLE - 1 FORMAT FOR PROVIDING DIMENSIONAL DETAILS**

SR NO	DEVICE	DIMENSIONS (WXHXD)	Wt IN KG	HEAT DATA	DISSIPATION	POWER CONSUMPTION

**Annexure -15**

**TABLE OF CONNECTIONS FORMAT**

SR NO	CABLE NO	CABLE TYPE	NO: OF CORES	FROM DEVICE	CONN REF	TERMINAL / PIN NO	TO DEVICE	CONN REF	TERMINAL / PIN NO	SIGNAL
1	CAB-1	XXX 3 CORE CABLE	1	DEV-A	P1	1	DEV-B	J1	1	
			2			2			2	
			3			3			3	