



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

DESIGN ENGINEERING

YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	2 of 74

TABLE OF CONTENTS

Sr. No.	DESCRIPTION	PAGE NO.
	SECTION I:	
--	INTRODUCTION	06
--	GENERAL CONDITIONS & REQUIREMENTS	07
1	Subject	07
2	Ship's Basic Particulars	07
3	Reference Environmental Conditions	07
3.3	Seaway Conditions	08
3.4	Propulsion Plant Operating Profile	08
4	Ship's Support Systems Supplies	08
5	Noise & Vibration	09
6	Noise Levels in Machinery Spaces	09
7	Vibration Isolators	10
8	Electrical Equipment Requirements	10
8.1	IP Rating for Electrical Equipment	10
9	Availability/ Reliability/ Redundancy/ Self Sufficiency	10
10	Documentation	10
10.4	Binding Design Documentation	11
10.5	Documentation Associated with Quality Assurance Plan, Equipment Manufacturing & FATs	13
10.6	Documentation Associated with STW/HATs/SATs	13
10.7	Technical Manuals for Equipment (Operation, Maintenance & Logistics)	13
11	Quality Assurance And Testing	14
11.1	Design Standards	14
11.3	Quality Assurance	15
11.4	FATs-(Factory Acceptance Trials)(Acceptance Test Procedure)ATP(QAP document)	16
11.5	Harbour Acceptance Trials/Sea Acceptance Trials	16
12	Maintenance & Logistics	17
13	Spares	17
13.2	Installation & Commissioning Consumables	18
13.3	On Board Spares (OBS)	18
13.4	Five-year Base & Depot Spares/Comprehensive Part Lists	19
14	Indigenisation/Local Support	19
15	Product Support	19
16	Materials	20
17	Interchangeability	20
18	Tally and Diagram Plates	20
19	Instruction Plates	21
20	Painting Specification	21
21	Lifting Arrangement	21
22	Preservation / Conditioning	21
23	Packing & Shipping	22



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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	3 of 74

24	Training	22
25	Security of Information	23
26	Warranty	23
27	Planned Delivery Date	24
28	Weight Recording / Weight Certificate	25
29	Maintenance Management Software	25
30	Technical Assistance	25
31	Receipt Inspection	26
32	Price	26
33	Compliance Matrix	26
34	Technical Offer as Per Shipyard Tender	26
35	INSTRUMENTATION	28
SECTION II: TECHNICAL SPECIFICATION		
1	Scope of Supply	29
2	Responsibility	29
3	Duty	29
4	Technical Parameters of Stabilizer System	32
5	Scope of Offer	48
6	Motors and Starters	49
ANNEXURES		
1	General Point For Motors And Starters	54
2	Cable Form List	59
3	List Of Connector Plugs, Heat Shrink Boots & Adapters	60
4	Table – 1, Table – 2, Table – 3	61
5	Table Of Connections Format	61
6	Deviation List	62
7	Weight Control Data Sheet	63
8	Weight Certificate	64
9	Compliance Matrix	65
10	Checklist with offer	66
11	Manufacturer's Recommended List Of Spares Tools And Software (MRL-OBS)	69
12	Reference Drawing for SPTA boxes	71
13	Maintenance Management Software (MMS) format	72
14	Timelines For Tasks And Deliverables (Durations)	73



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

DESIGN ENGINEERING

YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	4 of 74

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




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

DESIGN ENGINEERING
YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	5 of 74

LIST OF TABLES

SR. No.	DESCRIPTION	TABLE NO.
1	Ship's Basic Particulars	1
2	Reference Environmental Conditions for Equipment Design and Test Requirements	2
3	Seaway Conditions (Operational & Survival)	3
4	Ship's Support Systems Supplies	4
5	Documentation	5
6	Binding Design Documentation	6
7	Technical Manuals (Operation, Maintenance & Logistics)	7

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	6 of 74

SECTION 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 LRS/DNV/GL/BV/IRS/NK
4. The Supplier should submit the quotation based on the General Conditions & Requirements (GCR) and the Technical Requirement for Procurement of each equipment. Should there be any discrepancies between the GCR and the Technical requirement of each equipment, the technical requirement/ specification shall prevail.
5. Type approved by IACS authority(ABS/IRS) equipment to be offered by the Vendor
6. 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.
7. 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)
8. The list of indigenous lub oil / hydraulic oil to be furnished.





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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.

3009

REV. NO.

01

DATE

07.12.2023

PAGE

7 of 74

GENERAL CONDITIONS & REQUIREMENTS

- 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.
- Ship's Basic Particulars**: Project 01 - TS 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

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	8 of 74

(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. 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

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

3.4 **Complement :**

(a)	Officers	12
(b)	Subordinate Officers(SOs)/ Enrolled P ersonnel(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:** 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. Operational cycle of the ship will be 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

Sr. No	SYSTEM	SUPPLIES	REMARKS
(a)	Fuel system	Low sulphur high flash high speed diesel (LSHFHSD)	Indian equivalent





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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.

3009

REV. NO.

01

DATE

07.12.2023

PAGE

9 of 74

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


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

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	10 of 74

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.
- 7.3 Vibration measurements are to be carried out as per ISO 4868(XII)/latest amendment.

8. Electrical Equipment Requirements: General requirements for electrical equipment (including Motors & Starters) shall confirm as per attached Annexure – 1.

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 requirement in Section II.

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.


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

Sr. No.	Documentation	Remarks
(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



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	11 of 74

(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

Sr. No.	DRAWINGS / DOCUMENTATION
Level I : Submission <u>within 04 weeks</u> of placement of order by Shipyard	
(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
(c)	Assembly drawings of main & associated auxiliaries/components including:- <ul style="list-style-type: none"> • Main dimensions • Mounting arrangement (including details on shock mounts) • Bolting plan • Position & dimension of all Interface details • Operational and maintenance envelopes • Weights • Materials with their specifications • Centre of gravity & lifting points • Flow rate & direction • Etc.





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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	12 of 74


(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

Level II : Submission within 06 weeks of placement of order by Shipyard

(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

Level III : Submission within 08 weeks of placement of order by Shipyard

(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
(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

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	13 of 74

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 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.





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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.

3009

REV. NO.

01

DATE

07.12.2023

PAGE

14 of 74

Table 7

Description	Content	Number of copies
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 -7 above.

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

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:

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	15 of 74

- (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.

11.3.2 During equipment production, any deviation to the QAP/finalized



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	16 of 74


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 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



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	17 of 74

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, 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.
- 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 GRAQ 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.

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



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	18 of 74

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.

(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



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	19 of 74

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.

13.4.1 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.

13.4.2 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"**

13.4.3 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.

13.4.4 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

13.4.5 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.

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



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	20 of 74

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) 1st and 2nd Ops refit cycle – Operation cycle of 24 months followed by a refit.

(b) 3rd and 4th 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 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,




	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	21 of 74

Weight, Maker's Name, Sr. No. of Machine, Year of Manufacturing etc. shall be given in the motor tally plate.

- 18.3 Motor winding terminals ending at Connection Box shall have engraved tally number.
- 18.4 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.
- 18.5 Internal Cable-Cores terminating at the connection terminal strip shall have the same corresponding terminal ferrule no. Fixed / fitted on it.
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:** Standard painting procedure shall be applicable for suitability for marine environment. Equipment shall be cleaned, degreased and painted with two coats of anticorrosive marine paint & two finish coats. All equipment painting shall conform to CGBR 382 or equivalent International Standards.
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.
- 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 are 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.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	22 of 74

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).

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 :**

24.4 The equipment supplier is to impart training, to ship's crew, on aspects related to operation, installation, maintenance and repair of the equipment.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	23 of 74

24.5 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.

24.6 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:

26.4 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 subsequent Para) of the ship by shipyard MDL to the Indian Coast Guard, whichever is later. This is to be referred as 'Standard Warranty'.


26.5 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.

26.6 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.

26.7 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.

26.8 If within the period of warranty, the Training ship and (or) stores and (or) spares are reported by the Shipyard to have failed to perform as per the specifications, the Supplier



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	24 of 74

shall either replace or rectify the same free of charge, maximum within 15 days of notification of such defect by the Shipyard provided that the goods are used and maintained by the Shipyard as per instructions contained in the operating Manual.

26.9 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.

26.10 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.

26.11 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.

26.12 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.

26.13 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.


26.14 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.

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

26.16 **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:



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	25 of 74

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.

28.4 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.

28.5 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.

29.4 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.

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


29.6 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:

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



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	26 of 74

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

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





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


DESIGN ENGINEERING

YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	27 of 74

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 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

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	28 of 74

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.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	29 of 74

SECTION: II-TECHNICAL REQUIREMENT

1. SCOPE OF SUPPLY:

Scope of supply will cover Design, Manufacture, Inspection, Testing, Commissioning and Packaging & Forwarding of Fin Stabilizer, along with Power Unit Assembly, tank, starter cum control panel with associated fittings & instruments listed in this specification and its' Satisfactory Operation on board ship and during ship's sea trials & ship cruising. 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.

1.1 Each ship set of stabilizer system is to consist of:

The total Stabilizer System broadly consists of the following three sub-systems. The quantity mentioned is the per ship requirement:

- A. Fin Sub-System - 2 Units
- B. Hydraulic Sub-System - 2 Units
- C. Control Sub-System - 1 Unit

1.2 Type approved equipment by IACS authority to be offered by the Vendor along with unit certification from ABS & IRS Class

1.3 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. RESPONSIBILITY:

- a. Single point responsibility of proving the system and the Equipment supplied, and interfacing with other ship's systems shall be borne by the supplier.
- b. All the inputs/parameters specified in this TSP are to be verified by the supplier. The detail design of Stabiliser System as a whole is the responsibility of the supplier. All the supporting Calculations are to be supplied by the supplier along with the offer.
- c. System Input Signals: Input signals of ship's heading and log speed will be provided. Interfacing of these inputs signals is the responsibility of the Stabiliser Supplier.

3. DUTY.

- a. For reduction of rolling motion of the ship at higher speed, an active stabilizer system on each shipside shall be provided. Fins shall be arranged in such a manner that they do not protrude beyond shipside. A hydraulic power unit at each fin, driven by electric motor, shall execute the fin movements. The control of fin movements shall be depending on roll angle, rolling period and Meta centric height. Switching on and off control shall be performed from MCR and local. The main parameters are to be integrated with the IPMS





- b. A sensing device continuously monitors the ship's roll and transmits appropriate signals to the mechanism controlling the angle of tilt of the fins relative to their movement through the water. Each fin is thereby tilted to such an angle that, because of the ship's forward motion and the resulting hydrodynamic force on the fin, it exerts a moment on the hull opposing the incipient roll.

3.1. The stabilizer system shall generally include quantity as required:

A. FIN Sub-SYSTEM		
Sr. No	Description	Qty per Unit
1	Fin	01
2	Fin stock	01
3	Base plate - Hull Interface Block (Structure In Way Of Cartridge)	01
4	Tiller	01
5	Actuators	02
6	Out board bearing	01
7	Sea Gland (Inflatable Seal Housing)	01
8	In-Board Bearing	01
9	Lubricant Unit	01
10	Fin Locking Pin	01
11	Angle transmitter Assembly	01
B. HYDRAULIC Sub-SYSTEM		
Sr. No	Description	Qty per Unit
1.	Power Units	01 set
2.	Pump Isolation Manifold Block	01 set
3.	Supply Tank	01 set
4.	Distribution Block	01 set
5	Hand Pump Panels	01 set
6	Pressure Control Valves	01 set
7	Solenoid Operated By pass Valves	01 set
8	Off- loading Relief Valve	01 set
9	Pipes & Fittings - Piping – All inter-unit piping, fittings and clamps of hydraulic and lubrication system from storage tanks to Pumps / Rams / Greasing points	01 set
10	Permanent Circuit to flush the system.	01 set
C. CONTROL Sub-SYSTEM:		
Sr. No	Description	Qty per Unit



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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	31 of 74

1	Operator Control Panel (OCP)	1
2	Roll Sensor Unit /Vertical Gyro	1
3	Stabilizer Central Control Unit or	1
4	Local Control Units (LCU).	4
5	Servo Amplifier Units (SAU)	4
6	Fin Angle Transmitter Unit	4
7	Motor Starters Panel	4
8	MCR Alarm/Indicator Unit	1
9	Transformer and Rectifier Unit	If Required
10	ACOS for 415V, 3Ph main supply for starters. OEM to ensure restoration of stabilizer functionality while changing over to alternate supply or power failure.	4
11	Junction Boxes/ connection Boxes. All junction boxes will be provided by the OEM.	4

Note: 1) If firm will club stabilizer Central Control Unit, operation indication panel and status indication panel together into single panel. It will be acceptable to MDL.

2) Health status of the starter units and the hydraulic circuit -Provision should be available in stabiliser central control unit.


D. ACCESSORIES:

The Stabilizers systems are to be supplied with the following minimum accessories but not limited to:

Sr. No	Description	Qty per Unit
1	Gauge mounted on a panel	Supplier to specify
2	Couplings counter flanges for suction & discharge ends	Supplier to specify
3	Relief Valve	Supplier to specify
4	Bellows and any other accessories & instruments required for satisfactory functioning of the Stabilizers System	Supplier to specify
5	All accessories required for the normal functioning of the stabilizer system are to be supplied	Supplier to specify

3.2. The control and instrument panel is to be provided in the MCR for remotely controlling the stabilizers .The warning lamps are to be of Audio Visual Type, which are to be of the continuous burning type. The control and instrument panel provided is to contain the following indications:

- 1 Start/Stop indication.
- 2 Elect phase failure indication
- 3 Elect supply available normal / alternate indication.

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	32 of 74

- 4 Fin angle indicator.
- 5 Hydraulic oil level and low hydraulic oil level warning.
- 6 Hydraulic oil pressure and low hydraulic oil pressure warning
- 7 Filter clogged indication (For Return line, Suction line and boost line)
- 8 Fin over travel warning
- 9 Stabilizer control system to trip the stabilizer motor in case of fin over travel.
- 10 Fin lock engaged lamp.
- 11 Hydraulic oil temperature and high oil temperature warning.

Note: Above indicators are indicative; firm may provide/include the indication as per design requirements.

4. TECHNICAL PARAMETERS OF STABILIZER SYSTEM

The Stabilizer system is to be supplied complete with all accessories & Instruments required for the normal functioning of system. Each stabilizer unit shall consist of one non-retractable fins (each ship set is equipped with two stabilizer units) together with their hydraulic power units and control units. The equipment shall be a self-sustaining package having its own pumps, accessories, controls, surveillance, alarms, instrumentation etc. The plant is to be mounted on either on a common base frame or ski.

4.1. Fin Sub-System:

- a. Each fin shall be carried on a shaft, which passes through the hull in a direction normal to the skin so that the shaft and fin rotates about the shaft centre line.
- b. The fins shall be non-retractable trapezoidal non-flap type conforming to NACA 0015 (OEM to suggest). The fin shall be fabricated from steel plate to form a streamlined cross section. Each fin shall be carried on a shaft, which passes through the hull in a direction normal to the hull so that the shaft and fin rotate about the shaft centre line.
- c. The area of each fin shall be approx. **5.35 m²**. The fin area given is tentative and the OEM should calculate the exact Fin area based on the ship profile and also calculate the total lift.
- d. An arrangement is to be provided for hydraulic and mechanical locking of the fin when not in use.

4.2. The fin unit shall include the following: -

- (a) **Top plate assembly.** The top plate shall be suitable for installation from outside through the hull aperture. Seating material shall be compatible with ship's Hull steel specification viz. ABS Gr. B or Equivalent Ship building quality steel.
- (b) **Upper bearing.** The upper bearing shall take the weight of the fin and stock assembly and be sized to accommodate the oscillating duty cycle of the fin assembly.
- (c) **Tiller head.** The tiller head shall connect the cylinders to the shafts. The





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

DESIGN ENGINEERING

YARD:16101
FIN STABILIZER


T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	33 of 74

tiller shall accommodate the locking pin. The tiller material shall be of cast steel or equivalent.

- (d) **Fin angle feedback transmitter.** Fin angle feedback is to be provided by a resetting transmitter which is to be mechanically coupled to each fin mechanism. These units should also provide signals suitable for remote indication of fin angles by means of electrically operated indicators. Mechanical fin indication is to be provided for local reading.
- (e) **Fin Stock.** The fin stock shall be designed for the maximum loading and arranged for withdrawal inboard. Each fin stock is to be supported inside the hull by an integral structure containing the seawater gland and lower bearing. Stellite overlay to be provided on the Fin Shaft on the area exposed to sea water. Fin shaft is to be fitted with a sacrificial sleeve in way of the lower bearing or guaranteed against any correction requirements for 5 years after commissioning of the ship.
- (f) **Gland.** The gland arrangement shall prevent the ingress of water where the fin shaft passes through the lower bearing. The seawater gland should incorporate an inflatable seal for renewal of gland packing in afloat condition
- (g) **Lower Bearing.** The lower bearing shall support the fin shaft at the point where it passes through the hull.

4.3. The basic purpose of a fin unit is to support the fin and fin shaft such that they are free to rotate about the fin shaft center line when a torque is applied to the tiller by means of two hydraulic actuators. When the fins move to an angle, they generate hydrodynamic lift due to their velocity through the water. Since they move in opposite directions, this imposes a restoring torque on the ship to counteract the rolling motion. The fin specifications to be provided are:

a.	Type	non-retractable trapezoidal non-flap type conforming to NACA 0015 (OEM to suggest), 1 per side
b.	Fin Shaft diameter	To be supplied by the manufacturer
c.	Maximum Torque Available	To be supplied by the manufacturer
d.	Pressure equivalent to Torque	To be supplied by the manufacturer
e.	Working Range	To be supplied by the manufacturer
f.	Steel used for closing plates, fins, bearing housing and remaining structural components	Compatible with ship's hull steel specification viz. ABS Gr. B or Equivalent Ship building quality steel.
g.	Fin Area	5.35 m ²
h.	Fin Outreach	For fin outreach and fin mean chord, supplier to design as per fin area (5.35 m ²) proportionately.
i.	Fin Mean Chord	
j.	Correction of angle of heel during turning	The angle of heel to be zero up to a rudder angle of 5 degree and thereafter directly proportional to the


	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	34 of 74

		rudder.
k.	The outreach of the fins	Fins shall be arranged in such a manner that they do not protrude beyond shipside.

4.4. Hydraulic Sub-System:

- a. The hydraulic system is to include hydraulic cylinders for operating the fins, an oil tank, suction and micro discharge filters, a motor driven variable delivery pump, a hydraulic accumulator, pressure control valves, solenoid operated by pass valves and an off-loading relief valve to maintain the oil supply to servo-valves at constant pressure. The arrangement should be designed to minimize the electrical power requirement from the ship's system. In addition, it is important that a permanent circuit to flush the system during commissioning and re-commissioning is to be built into the system.
- b. Each fin shall be moved by its individual power unit. Each power unit is to consist of an electric motor of suitable capacity driving a pump.
- c. The motor is to be coupled with the pump by a flexible coupling. A relief valve shall be fitted on the discharge side of the pump.
- d. The servo pump stock shall be controlled by an Electro-hydraulic servo valve responding to signals generated in the stabilizer control system.
- e. Immediate proportional response of the fin to any demand should be assured.
- f. The stabilizer will operate in the Auxiliary engine room and should be designed to offer maximum possible resistance to corrosion arising from contact with salt water or oily water.
- g. Each actuator is to be provided with the following:-
 - (a) Drain plug in an accessible position remote from the inlet to permit flushing of the equipment.
 - (b) A relief valve with discharge led back to the low-pressure side of the system.
 - (c) An air bleed valve.
- h. The actuating of fin is to be controlled from signals provided from the gyro control unit.
- i. A seawater cooled oil cooler for cooling hydraulic oil returning to the tank is to be provided. The maximum oil temperature should not exceed 65 deg C. The maximum sea water temperature for the cooler should be taken as 35 deg C. An oil tank of adequate capacity fitted with draining and cleaning facilities, local and remote contents gauge is to be provided for each unit. Positive head should remain at pump suction at all specified conditions of heel, roll, trim and pitch.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	35 of 74

- j. An automatic lubrication system for all bearing and sliding surfaces is to be provided. Alternatively arrangement is to be provided for manual operation.
- k. Recommended list of lubricants for main equipment and all its accessories is to be submitted by the manufacturer.
- l. Filters are to be provided at suction inlet to each pump. Return lines are to discharge below minimum level and in a different compartment of the tank separated by a wire from the sections, from which pump suction occurs. Tank capacity is to be sufficient to allow at least 2 minutes operation at Maximum Pumping rate. Level indication is to be on the side of the tank from which the pumps take suction.
- m. Flexible hoses and accessories required for hydraulic interconnection of the power units to associated equipment are to be provided. All mountings and foundation bolts for all units are to be supplied. Inflatable sealing arrangement should be provided at the sea gland. A mechanical fin angle indicator (pointer with graduated scale) is to be provided for both fin stocks in a suitable position where a local operator can see the same while operating the hand pump.
- n. The pump will be fitted with isolating valves as required to provide isolation without the need for shutting down the system / equipment during maintenance.
- o. Gauges and monitoring equipment or devices will be arranged to permit ready vision or audibility with general operating area of the equipment. They will be suitably designed to allow for all stresses due to thermal expansion and deflection of ship's structure.
- p. Heavy duty anti corrosive coating to be applied on part of the fin stock which is exposed to water. The coating is to be guaranteed against corrosion for five years after commissioning.

4.5. Hydraulic Sub-System's Equipment Specifications:

1.	HYDRAULIC ACTUATORS	
a.	Type	To be Supplied by the Manufacturer
b.	Make	To be Supplied by the Manufacturer
c.	Size	To be Supplied by the Manufacturer
d.	Stroke	To be Supplied by the Manufacture
2.	LIMIT SWITCH	
a.	Over Travel Switch	To be Supplied by the Manufacturer
b.	Mechanical Locking Switch	To be Supplied by the Manufacturer





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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.

3009

REV. NO.

01

DATE

07.12.2023

PAGE

36 of 74

3.	LUBRICATION SYSTEM	
a.	Type	To be Supplied by the Manufacturer
b.	Make	To be Supplied by the Manufacturer
c.	Capacity	To be Supplied by the Manufacturer
d.	Grease	To be Supplied by the Manufacturer.
4.	PUMP	
a.	Type	To be Supplied by the Manufacturer
b.	Make	To be Supplied by the Manufacturer
c.	Relief Valve Setting	To be Supplied by the Manufacturer
d.	Servo Valve	To be Supplied by the Manufacturer
e.	Output	To be Supplied by the Manufacturer
5.	ELECTRIC MOTOR	
a.	Make	To be Supplied by the Manufacturer
b.	Type	To be Supplied by the Manufacturer
c.	Rating	To be Supplied by the Manufacturer
d.	Synchronous Speed	To be Supplied by the Manufacturer
e.	Main Supply	To be Supplied by the Manufacturer
f.	Heater Supply	To be Supplied by the Manufacturer
g.	Enclosure	To be Supplied by the Manufacturer
h.	Insulation	To be Supplied by the Manufacturer
6.	FLEXIBLE COUPLING	
a.	Make	To be Supplied by the Manufacturer
b.	Type	To be Supplied by the Manufacturer
c.	Rated Torque	To be Supplied by the Manufacturer
7.	SERVO PRESSURE FILTER	
a.	Make	To be Supplied by the



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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.

3009

REV. NO.

01

DATE

07.12.2023

PAGE

37 of 74

		Manufacturer
b.	Type	To be Supplied by the Manufacturer
c.	Element Mesh	To be Supplied by the Manufacturer
8.	OIL COOLER	
a.	Make	To be Supplied by the Manufacturer
b.	Type	To be Supplied by the Manufacturer
c.	Capacity	To be Supplied by the Manufacturer
d.	Oil Flow	To be Supplied by the Manufacturer
e.	Water Flow	To be Supplied by the Manufacturer
f.	Process Connection	To be Supplied by the Manufacturer
9.	HYDRAULIC ACCUMULATOR	
a.	Make	To be Supplied by the Manufacturer
b.	Type	To be Supplied by the Manufacturer
c.	Capacity	To be Supplied by the Manufacturer
d.	Pre-Charge	To be Supplied by the Manufacturer
e.	Pressure Gauge Range	To be Supplied by the Manufacturer
10.	SUPPLY TANK	
a.	Make	To be Supplied by the Manufacturer
b.	Type	To be Supplied by the Manufacturer
c.	Capacity	To be Supplied by the Manufacturer
d.	Level Gauge	To be Supplied by the Manufacturer
e.	Valve	To be Supplied by the Manufacturer
f.	Return Connection	To be Supplied by the Manufacturer
g.	Hand Pump Connection	To be Supplied by the Manufacturer
h.	Suction Connection	To be Supplied by the Manufacturer
i.	Air Breather	To be Supplied by the



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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.

3009

REV. NO.

01

DATE

07.12.2023


PAGE

38 of 74

		Manufacturer
j.	Level Switch Thermo Switch	To be Supplied by the Manufacturer
11.	SUCTION FILTER	
a.	Make	To be Supplied by the Manufacturer
b.	Type	To be Supplied by the Manufacturer
c.	Element Mesh	To be Supplied by the Manufacturer
12.	Distribution Block Assembly	
a.	Make	To be Supplied by the Manufacturer
b.	Type	To be Supplied by the Manufacturer
13.	EMERGENCY MANUAL HAND PUMP ASSEMBLY	
a.	Make	To be Supplied by the Manufacturer
b.	Type	To be Supplied by the Manufacturer
c.	Pump Performance	To be Supplied by the Manufacturer

4.6. Control Sub-System (Control and Monitoring):


- a. Both stabilizers should be capable of being operated without any watch keeping requirements. The system should be fully integrated into the Integrated Platform Management System (IPMS). A provision for starting/stopping the stabilizers from MCR must be made. During routine operation, the plant shall be started / stopped locally for the initial start/ final shut down and thereafter operated remotely from the Machinery Control Room (MCR) for all intermittent starts / stops. A separate remote panel is to be provided in the MCR. This panel is to include fin angle indication, system pressure, log speed and indication of malfunction/ alarms, etc.
- b. Instrumentation: The instrumentation set should enable monitoring plant performance and assist in fault / defect analysis and rectification. A central instrument / control panel is to be an integral part of the plant. The instrument / control panel shall be independent for all stabilizer fin units. It should be possible to operate each fin unit from its LCP independently to carry out any maintenance work on the same. Stabilizer will take input from vertical gyro (roll sensor) which is supplied by OEM of stabilizer and the speed signal from the ship.
- c. The gyro control unit shall determine at every instant the angle which the fin should take up by sensing the rate of roll and angle of roll of the ship. The compatible signal produced by the gyro control unit is to be supplied after suitable

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	39 of 74

amplification, to the rotary servo valves on the variable delivery pump. The control is to be entirely automatic so that no operational adjustments would be necessary.

- d. The automatic feedback control system is required to ensure proper fin setting to develop desired lift and hence stabilizing torque proportional to and in opposite direction of ship's roll. The error signal for actuation of the control system is the resultant of a signal from fin angle transmitter activated by the fin stock and from the roll sensing system.
- e. A fin angle selector function (5°-10° -15° -20°... etc) is to be incorporated in the control panel, and the fins arranged so that a maximum fin angle can be set at speeds up to the maximum speed of the ship. The control system should also restrict fin angle activity to meet the operating requirement for reduced noise when the "Quiet" mode of operation is selected.
- f. The manufacturer is to furnish data on fin angle demand as a function of roll amplitude, velocity and acceleration so that performance can be assessed by simulation. The control system should compensate for increased effectiveness of the stabilizer fin as the ship's speed increases by reducing the fin demand accordingly, thereby avoiding over stressing of the fin shafts.
- g. Fin should automatically centre before hydraulic system shuts down, on failure of control and also on switching off. Heel correction control is to be provided. Indication of "Mechanical Lock On" is to appear on control console. The interlock is to prevent inadvertent starting in such a situation.
- h. The electrical control gear is to include auto-change over switch for connecting 'Normal' or 'Alternate' supply for each pair of stabiliser.
- i. Instruments supplied should have complete details of OEM, Test certificates, Calibration procedure etc.
- j. The control and monitoring system offered should be capable of being interfaced with an Integrated Platform Management System (IPMS). The equipment manufacturer will therefore be required to interact with the IPMS supplier. Signal list, as required by the IPMS supplier and System Integrator is required to be furnished subsequently. OEM to provide one IPMS interface with stabilizer system. IPMS interface shall be provided from the stabilizer Central Control Unit (CCU).
- k. The control interface requirements are as follows:-
 - (i) All analogue controls-4-20 m Amps.
 - (ii) RTD signal shall be PT 100, three wires.
 - (iii) Potentiometer shall be excited by all external voltage sources
 - (iv) All binary indication signals shall be dry contact type.
 - (v) All binary contact inputs shall be compatible with switches and
 - (vi) 24 V signal from the control system.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	40 of 74

- I. The warning lamps are to be of Audio Visual Type, which are to be of the continuous burning type.

Note: - Electronic architecture of system shall be VME based. It shall be able to interface with IPMS through MODBUS.

4.7. Performance


The requirements are:

- i. Travel of Fin at 13-14 Knots (Normal Cruising Speed) is $\pm 28^\circ$
 - ii. Travel of Fin at 20 Knots (Maximum Speed) is to be determined by the OEM
 - iii. The stabilizer system is to be capable of correcting the roll effectively at maximum significant wave height of 6 m with the ship sailing at 12-15 knots.
- a. The fin is to be designed for highest possible angles, speed of cavitation and vortex inception. Cavitation inception and vortex inception curves and recommended mode of silent operation are to be provided. Cavitation is not permissible throughout the operating regime-
 - b. The action on the fin stabilizers shall be to apply artificial damping of the hull by generating a torque about the roll axis, which is proportional and opposes the roll of the vessel. The degree of proportionality shall be adjustable to suit the vessel and there shall be a limit to the proportionality when the fin reaches their limit of movement at an angle of incidence just below the stall angle.
 - c. The fin and fin shaft should be able to withstand stresses at max fin angle and at ship speed of up to 20 knots. At maximum speed, movement of the stabilizer beyond applicable travel of Fin angle should not produce stresses above safe limits on the fin stock. When the ship is moving astern at maximum speed astern, no undue stresses must be imposed on fin, fin shaft or locking arrangements.
 - d. The approximate torque shall be calculated by the stabilizer vendor based the tentative fin area provided by the shipyard and is to be supported by detailed calculations. These are to be submitted along with the offer including calculations of the hydrodynamic forces on the stabilizer fins, Centre of pressure on the fin, etc.

4.8. Functional Characteristics:

- a. The stabilizer gear shall be controllable from the following positions:
 - i. Local (from Compartment) - For initial checks, testing and tuning
 - ii. Machinery Control Room - Remote operation and monitoring




	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	41 of 74

- b. Each stabilizer unit shall consist of one non-retractable fin together with their hydraulic power and control units. The equipment shall be a self-sustaining package having its own pumps, accessories, controls, surveillance, alarms, instrumentation etc. The plant is to be mounted on either on a common base frame or skid.
- c. The outreach of the fins is to be kept within the ship's waterline as far as possible, but in no event is to extend beyond shipside.
- d. The stabilizer system is to be capable of correcting the roll effectively at maximum significant wave height of 6 m with the ship sailing at 12-15 knots.
- e. The designed total lift from the fins is to be calculated by the OEM at the ships maximum speed. The supplier is to provide supporting calculations of the lift from the fins.
- f. The stabilizer should be able to roll the ship in calm water at 12-15 knots by +3.5deg. Alternatively, system capability may be indicated.
- g. System Input Signals. Input signals of ship's log speed will be provided. Interfacing of these input signals is the responsibility of the stabilizer supplier.
- h. The supplier is to provide supporting calculations of the lift from the fins and performance calculations.
- i. Percentage stabilization the system is to be capable of providing at different sea states. Headings and speeds are required to be indicated in the form of graphs.
- j. The supplier is required to provide system mixing and performance calculations as well as listing/source code/output of programme used for calculations and simulations.
- k. All the inputs/parameters specified in this TSP are to be verified by the supplier. The detailed design of stabilizer system as a whole is the responsibility of the supplier. All the supporting calculations are to be supplied by the supplier along with the offer.

4.9. Emergency Arrangements.

- a. Readily accessible Emergency Hand operating arrangements are to be provided. In the absence of electrical power, these arrangements shall be capable of centralizing the stabilizer fins whilst the ship is stopped in water. Hand pumps are to be provided mounted in a readily accessible position, to move fin into any desired position in the working range in the absence of the main hydraulic drive. Means are to be provided to isolate the auxiliary pump / hand pump from the system when not in use. A set of flexible hoses suitable for emergency replacement of hydraulic system piping is to be provided.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	42 of 74

- b. Isolation valves are to be so located so as to minimize the necessity to empty the hydraulic circuit for maintenance or replacement of equipment.

4.10. Safety Devices

4.10.1 Instrumentation. The minimum essential instrument panel for pumps will include Pressure gauges for suction & discharge in local position only. Failure of one or more of these gauges shall not make the equipment / system non-operational. Root connection of the gauge piping should be at the pressure source. Scale of instruments shall be so selected that the maximum normal pressure will be approximately 75 percent of the full-scale range and system-operating valves are in the two thirds of the scale range. Gauge piping will be connected with 08 mm OD copper tube. Instrument gauge board shall be 1/8 inch thick of steel. Instrument gauge board shall be independent for each individual equipment / system.

4.10.2 Analogue gauges should indicate the following at the local control panel. These signals are to be available through IPMS at the remote control panel in MCR/ SCC.

- (i) Hydraulic Oil pressure
- (ii) Hydraulic Oil Temperature
- (iii) Oil level Gauge Glass
- (iv) Cooling water pressure
- (v) Cooling Water Temperature

4.10.3 Alarms / Fault indication for the following are to be indicated both through on the LCP and IMCS.


- (i) Low oil level in service tank
- (ii) High Oil Temperature
- (iii) Filter clogged indication
- (iv) Power fail
- (v) Power Pack Fail
- (vi) Motor overload
- (vii) Auto Fail
- (viii) Control Failure (from MCR)

4.10.4 All gauges and instruments supplied are to be calibrated and supplied with calibration certificates, which would be valid during commissioning. Calibration procedure for all gauges is to be provided.

4.10.5 Instruments supplied should have complete details of OEM, Test certificates, Calibration procedure etc.

4.10.6 Safety, control and monitoring devices are to be fitted on equipment as per requirement. All Miscellaneous items are to be fitted as per functional



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
	FIN STABILIZER	DATE	07.12.2023	
		PAGE	43 of 74	


requirement of the system All piping material for Lube oil, cooling pipe line, insulation material with necessary instrument & accessories also valve & Instruments fitted in sea water system.

4.11. Specific document to be supplied with offer :

(In addition to Technical Offer as Per Shipyard Tender Para-34 of General Condition & Requirement)

- (a) Outline drawings of the equipment indicating overall dimensions, C.G. and Maintenance envelope.
- (b) Sectional drawings of major sub-assemblies and components.
- (c) Hydraulic, Lubrication and Control System Schematics.
- (d) Complete Weight breakdown (excluding & including oil).
- (e) Instrumentation List & Diagram.
- (f) Seating and Installation particulars including manufacturing details & securing foundation bolts.
- (g) Brief Technical Specification.
- (h) Brief on integration of stabilizers system with ship's Integrated Control System.
- (j) Inter-unit cabling diagrams clearly indicating each unit/sub-unit and types of cables being used for the system.
- (k) Details of pump/motor/starter etc.
- (l) Details of other ship services required.
- (m) Requirement of Greases, Oils etc., with their equivalents.
- (n) Tools required for maintenance.
- (p) Recommended on-board spares holding (for 3 years operation)
- (q) Proposed factory tests and Inspection plan.
- (r) Proposed preservation plan.
- (s) Manufacturers list of spares for installation and commissioning.
- (t) Delivery time from receipt of order.
- (u) Clear demarcation between the scope of supply of firm and that of the yard.
- (v) List of equipment required for installation and operation of the equipment and not supplied by the manufacturer.
- (w) Trial and commissioning time of complete system on board.
- (x) Specials tool and test equipment to be supplied for on-board maintenance.
- (y) Part identification list (PIL).
- (z) List of main equipment included in the standard scope of supply.
- (aa) List of accessories inclusive / not inclusive in the standard scope of supply.
- (ab) Reliability parameters as specified in chapter 4.
- (ac) User list of similar equipment supplied by the manufacturer.
- (ad) Proposed Quality Assurance & Quality Inspection Plan.
- (ae) Itemised price list of major components, and other services offered.
- (af) The offer should be strictly conforming to the details indicated in this specification and in the relevant specifications / drawings / documents (All Latest Issues are to be followed).



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	44 of 74

- (ag) 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.
- (ah) 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;
- (aj) Any clarification required regarding Technical Specification / Requisition be sought before submission of the offer.

4.12. Interface to IPMS:

- 4.12.1 The equipment will be monitored by IPMS system. The IPMS will interface to the stabilizers equipment through a common serial link for Aft GTR and Fore GTR stabilizers system with RS 422/RS 485 standard, MODBUS RTU protocol. IPMS interface to be provided from the Stabilizer Central Control Unit.
- 4.12.2 The firm has to indicate the signals which are to be exchanged to IPMS through serial link. The firm has to submit the MODBUS I/O form list at the time of offer. The detailed list of I/O which is exchanged through the serial link will be finalized at TNC.
- 4.12.3 IPMS INTERFACE SIGNALS FOR MOTORS:
 - (a) Lamp 'ON' indication – equipment running
 - (b) Lamp indication – Fault.
 - (c) Lamp indication – Availability of supply.
 - (d) Remote selector switch – Auto / manual.
 - (e) Start push and
 - (f) Stop push.

4.13. Electrical Requirement:

- 4.13.1 The starter shall be so designed that whenever the normal / alternate supply change over occurs, the motor should not trip, by incorporating a suitable delay mechanism.
- 4.13.2 The Auto Change over Switch functional and design requirement should be as per Chapter-8
- 4.13.3 Free end connectors (plugs/sockets) for cables to be connected to system equipment's during installation and commissioning of system, is to be provided by the supplier wherever required. Each free end connectors to be supplied with proper identification.





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

DESIGN ENGINEERING

YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	45 of 74

- 4.13.4 Shock mounts Cable lugs, ferrules, pins or any other items required to complete the installation of the system onboard are to be provided by the supplier.
- 4.13.5 DGS Marine Glands with portable plate in undrilled condition for all Electrical Equipment's should be supplied.
- 4.13.6 The starter shall be so designed that whenever the normal / alternate supply change over occurs, the motor should not trip, by incorporating a suitable delay mechanism.
- 4.13.7 Greasing Outlet for Motor:-
- (a) Greasing inlet and outlet to be provided for motor.
 - (b) Greasing arrangement to be provided with a tally plate on the motor indicating type & quantity of grease & frequency of greasing. Further the motor tally plate should indicate the DE & NDE bearing details i.e. type, number, make etc., so that the detail will be readily available to carryout checks on bearing using shock pulse monitor.
 - (c) The motor manufacturer shall guarantee at least 40,000 working hours as the life of the bearings.

4.14. MOTORS AND STARTERS:

Motor:

4.14.1 Technical Specifications: The motors shall be capable of developing specified rated output at extreme environmental conditions, ambient temperature, voltage and frequency. While developing the rated output at such extreme conditions, the temperature rise of the motor shall be maximum 10 deg C higher than the permitted temperature rise at nominal voltage, frequency and temperature. The motors are to be manufactured for satisfactory performance under the following conditions and input supply characteristics /specifications:

- (a) Rated voltage - 415V
- (b) No of phases - 3(Three) 3 wire supply system
- (c) Voltage Tolerance
 - I. Steady state - $\pm 0.5\%$ at all load.
 - II. Voltage range - -15% to +10%
 - III. Recovery time - 01 second.
- (d) Frequency
 - I. Nominal frequency - 50 Hz
 - II. Constant load tolerance - ± 0.5 Hz or $\pm 1.0\%$
 - III. Load range tolerance - ± 1 Hz or $\pm 2.0\%$
 - IV. Transient - $\pm 2.5\%$
 - V. Time of recovery - 2 Sec to within 1 % of transient
 - VI. Frequency range - $\pm 3\%$
- (e) Cooling - Air Cooled
- (f) Enclosure - IP 55-Motors installed below deck



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

DESIGN ENGINEERING

YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	46 of 74


- Deck
- IP57-Motors installed on weather
 - IP 58-Submersible motors up-to 10 mtrs.
 - IP 68- Submerged beyond 10 m.
- (g) Frequency at rated load - 50Hz
- (h) Power factor - 0.7 lagging up-to 5 KW
- 0.8 lagging above 5 KW
- (i) Rating - Continuous rating
- (j) Efficiency - Motor should conform to efficiency Class
Efficiency – 2 (improved efficiency)
mentioned at table 1 to 4 of IS 12615:
2004
- (k) Insulation - Class 'F' or above
- (l) Painting - Pebble grey, RAL 7032 epoxy power coated.

4.14.2 Environmental Conditions: The design of the Motor should cater for the most adverse of the environmental and ambient conditions. The AC Motor and control equipment shall conform to the following specification:-

- (a) Ambient temperature - 0 to 55 deg C
- (b) Relative Humidity - 30-100% at 35 deg C
- (c) Ship Motion
- (i) List - 30 deg
 - (ii) Roll - ± 30 deg
 - (iii) Pitch - ± 15 deg

4.14.3 Motor Protection. All motors are to be provided with a means of protection from voltage variation of -15% to + 10% and overloads. The motor thermal protection system is to be designed to trip the motor when the winding has reached the maximum safe temperature of the insulation. The motor thermal protection system must detect the occurrence of maximum temperature by means of Positive Temperature Coefficient Thermistors (PTCT). The PTCTs provided in each phase of the windings shall be connected in series and only one pair of leads shall be brought out to separate terminals in the motor terminal box. The PTCT leads are to be taped to the stator leads for support.

4.14.4 Starting Current. The value of starting current shall not exceed 6 to 7 times the full load current for motors of capacities up to 75 kW and 4 to 5 times full load current for motors of capacities above 75 kW. These values are applicable to direct on line starting only. No positive tolerance is allowable on starting current. For Star-Delta/Reactive type starters, the starting current for motors with star-delta starters should not be more than 3 times of rated current. In order to limit the starting current, DOL starters shall be used for motors up-to 10 KW rating.

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	47 of 74

4.14.5 Over-Speed. All motors are to be designed to withstand, without excessive noise and vibration or damage, unloaded operation for a period of 15 minutes at a speed 15% in excess of the highest synchronous speed, i.e. the speed corresponding to the specified frequency plus the frequency tolerance of the supply.

Starter:

4.14.6 Design and Performance. The individual components of the starters should conform to the relevant IEC and IS applicable for respective products. The starter system should consist of motor starter with following associated components: -

- (a) Main incomer switch- disconnecter fuse/MCCB of SCPD unit for isolation purpose.
- (b) HRC fuses for motor, cable & switchgear protection against short circuit.
- (c) Line contactor for physical isolation (ON/OFF either from local or from remote) under operation of protection system.
- (d) Intelligent microprocessor based Motor Protection Unit for Comprehensive protection.
- (e) Ultra fast acting semiconductor fuses for thyristor protection (applicable to thyristor based soft starters).
- (f) By-pass contactor for by-passing the controller during normal run condition (to improve the life of the thyristors).

4.14.7 Starter Protection:


8.7.1 Starters for all motors of up-to 15 kW rating should be incorporated with microprocessor based intelligent device called Microprocessor Protection Unit (MPU). Motors above 15 kW capacity are to be fitted with soft starters. The MPUs should be able to clearly distinguish between starting/running conditions of the motor. The following protections from the above should be available at the time of motor starting & running:-

- (a) Earth Fault
- (b) Overload
- (c) Short circuit
- (d) Too many start
- (e) Stalling
- (f) Single phase
- (g) Start Time out
- (h) Internal error
- (j) Start inhibit

8.7.2 Following protections should be available only during running condition of the motor:

- (a) Voltage Unbalance
- (b) Undercurrent



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	48 of 74

- (c) Over Load
- (d) Over current
- (e) Under voltage

4.14.8 Internal Wiring. LFH (Limited Fire Hazard) cables are only to be used for internal wiring.

4.14.9 Routine Tests. Following routine tests are to be carried out on the motor.

- (a) No-Load.
- (b) Over Speed
- (c) Winding Resistance
- (d) With stand Voltage Test (High voltage test).
- (e) Standard Withstand Voltage Test
- (f) Insulation Resistance

4.14.10 Test Results. The test data obtained during performance tests of motors in factory premises be logged and following graphs be generated to evaluate the motor performance.


- (a) Torque vs. Speed
- (b) Current vs. Speed
- (c) Current vs. Time
- (d) Efficiency vs. Output
- (e) Power factor vs. output

5. **SCOPE OF OFFER:**

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

- i. IMO Type Approval certificate
- ii. Technical Specification of the equipment's.
- iii. Details of all connections to equipment, Vibration details with pattern no, seat details, flange details etc.
- iv. GA drawing of all equipment's, sub-assemblies & accessories.
- v. Technical parameters of all equipment & accessories.
- vi. Outline drawings of the equipment indicating overall dimensions, C.G. and Maintenance envelope.
- vii. P & ID diagram.
- viii. Complete Weight breakdown (excluding & including oil).
- ix. Heat dissipation of the Equipment
- x. Details of other ship services required.
- xi. Tools required for maintenance.
- xii. Recommended onboard and base spares holding (for 3 year and 5 years operation respectively)
- xiii. Manufacturers list of spares for installation & Commissioning.
- xiv. Instrumentation List & Diagram.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	49 of 74

- xv. Brief on integration of Fin Stabilizer Control System with ship's Integrated Control System.
- xvi. Inter-unit cabling diagram clearly indicating each unit/sub-unit and types of cables being used for the system.
- xvii. Requirement of Greases, Oils etc., with their equivalents.
- xviii. Proposed factory tests and Inspection plan.
- xix. Proposed preservation plan.
- xx. Delivery time from receipt of order.
- xxi. Clear demarcation between the scope of supply of firm and that of the yard.
- xxii. List of equipment required for installation and operation of the equipment and not supplied by the manufacturer.
- xxiii. Trial and commissioning time of complete system on board.
- xxiv. Special tools and test equipment to be supplied for on board maintenance.
- xxv. List of main equipment included in the standard scope of supply.
- xxvi. List of accessories inclusive / not inclusive in the standard scope of supply.
- xxvii. List of tools & accessories required for installation & commissioning
- xxviii. Reliability parameters.
- xxix. Proposed Quality Assurance & Quality Inspection Plan.
- xxx. User list of similar equipment supplied by the manufacturer.
- xxxi. Details of standard and optional factory tests.

6. MOTORS AND STARTERS


6.1 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.

6.2 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.

a. Starters shall be provided with the following components:-

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




	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	50 of 74

- a. 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.
- b. 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.
- c. 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.
- d. 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 JB's on spaces exposed to weather.
- e. All motor including fractional HP motor shall be suitable for 415 volt, 3 ph, 50Hz AC/230V, 1 Ph, 50 HZ supply except for COTS equipment/domestic equipment which will be to manufacturer's standard.
- f. 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.
- g. Motor fitted on whether deck shall be of IP 56 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.
- h. All motor weighing 20 kgs and above shall be provided with lifting eye bolt
- i. 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.
- j. 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

6.3 Mechanical construction:

- a. 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.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	51 of 74

- b. The control panel shall be suitable for bulkhead mounting with necessary bolts, nuts, washers, spring shock mount, screw less terminal etc.
- c. 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.
- d. Size of the panel to be as small as possible considering space constraint on ship
- e. Starter panel to be painted with polyester powder coating of RAL -7032 paint

6.4 Cable connection

- a. Internal wiring shall be made by using LFH type copper multi standard conductor flexible cables of adequate rating with minimum 1.5 sq mm. size and has to be nearly dressed and bunched.
- b. All control and auxiliary wiring shall be provided with numbered ferrules at both ends for easy identification.
- c. Adequate Crippage distance (Minimum 20mm space) for connecting the cable inside the cable should be provided
- d. 10% spare terminal to be provided
- e. All electrical support inside the starter panel shall be of high quality and moisture resistant material. the contact surfaces and stud of all devices , to which electrical connection are made shall be tinned.


6.5 Name plate:

- a. Name plate of English made from aluminium (black) shall be provided for all devices in the panel to identify their function.
- b. A laminated circuit diagram plate to be provided inside the panel at appropriate place. Suitable earthing bolts to be provided for eating the panel with the ship hull.
- c. Component tallies shall be provided for all the component inside the starter panel.
- d. Operating voltage tally shall be provided on the front top. Operating voltage tally shall be in RED mark.

6.6 Other requirement of motor & starter:

- 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/ patter number and quantity in numbers are to be furnished in the offer. These spares are to be supplied as part of the equipment.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	52 of 74

b. General arrangement Drawing of motor and starter including weight, dimension, internal wiring diagram , calibration certificate for timer, thermistors and overload relay as applicable

c. Acceptance of motor and starter will be subject to satisfactory result of performance tests and routine test.

6.7 OEM's responsibility-

a. OEM to Prepare system drawing/Cable drawing in autocad .dwg format .

b. OEM to prepare cable schedule, connection schedule of the system.

c. Connectorisation of the delivered equipment and termination of the cable will be done by OEM onboard.

d. Interfacing of third party equipments/System and handshaking of data will be OEM's responsibility to prove system onboard.

e. Single point responsibility of providing the system and the Equipment supplied, and interfacing with other ship's systems shall be borne by the supplier.

f. All the inputs/parameters specified in this TSP are to be verified by the supplier. The detail design of Steering Gear System as a whole is the responsibility of the supplier. All the supporting Calculations are to be supplied by the supplier along with the offer.

g. System Input Signals: Input signals of ship's heading and log speed will be provided. Interfacing of these inputs signals is the responsibility of the Stabiliser Supplier.

6.8 CABLES:

a. 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 equipments, sub-system equipments, 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.

b. 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.

c. All the cable should be LFH type.





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

DESIGN ENGINEERING

YARD:16101
FIN STABILIZER


T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	53 of 74

6.9 Power Supply:

a. Stabiliser 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 stabiliser 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.

b. 230V, 50Hz, 3 Ph supply will be provided as normal and alternate supply input to the auto changeover switch supplied by stabiliser vendor.

c. ACOS shall be stabiliser vendor's scope of supply.

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	54 of 74

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) Crippleage distance of 20mm space for connecting the cables inside the terminal box should be provided.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	55 of 74


3. **General.**

- (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).



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	56 of 74

- (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.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	57 of 74

(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.



	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	58 of 74

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

(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.





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

DESIGN ENGINEERING

YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	59 of 74

Annexure "2"

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



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

DESIGN ENGINEERING

YARD:16101
FIN STABILIZER

T.S.P. NO. 3009

REV. NO. 01


DATE 07.12.2023

PAGE 60 of 74

Annexure "3"

LIST OF CONNECTOR PLUGS, HEAT SHRINK BOOTS & ADAPTERS

CONNECTOR			CABLE		ADAPTOR		BOOT HEAT SHRINK
PART NO	SHELL SIZE	PINS	PART NO	SHEATH IN MM	PART NO	ENTRY SIZE	PART NO

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	61 of 74

Annexure "4"

TABLE-1 FORMAT FOR PROVIDING DIMENSIONAL DETAILS

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

Annexure '5'

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	





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

DESIGN ENGINEERING

YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	62 of 74

Annexure '6'

DEVIATION LIST				
<p>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.</p>				
SR. No.	DOCUMENT No./ CLAUSE No.	REQUIREMENT	DEVIATION WITH REASONS	CGHQ / MDL REACTIONS
SUPPLIER'S COMPANY SEAL DATE			SUPPLIER'S SIGNATURE & DATE	
A-ACCEPTED N-NOT ACCEPTED C-CONDITIONAL ACCEPTANCE (SEE ATTACHED SHEET)				



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

DESIGN ENGINEERING

YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	63 of 74

Annexure '7'

WEIGHT CONTROL DATA SHEET

EQUIPMENT DESCRIPTION		EQUIPMENT NO.	
COMPARTMENT		LOCATION	

SWBD :

TOLERANCE CODE
 PRELIMINARY EST.
 DESIGN EST.
 M.T.O (CALC)
 WEIGHED
 TOLERANCE ± %

1. WEIGHT (Kg.)

(a)	DRY		Kg ±	%
(b)	FLUID		Kg ±	%
(c)	OPERATING		Kg ±	%
(d)	TEST		Kg ±	%
(e)	TOTAL		Kg ±	%

2. EQUIPMENT DIMENSIONAL DATA (mm) & Co-ordinates of CoG

<p>PLAN</p> <p>ELEVATION</p>	<p>PLAN</p> <p>ELEVATION</p>	<p>PLAN</p> <p>ELEVATION</p>
--	--	--

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.

SUPPLIER'S SEAL

SUPPLIER'S SIGNATURE & DATE



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


DESIGN ENGINEERING

YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	64 of 74

Annexure '8'

WEIGHT CERTIFICATE			
EQUIPMENT DESCRIPTION:		EQUIPMENT NO. :	
The form shall be completed by Supplier & shall be supplied along with the equipment.			
SUPPLIER'S NAME		Ref. Drg. No.	
ADDRESS		Part No.	
TELEPHONE NO.		EQPT. NO.	
ORDER 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.)		<input type="text"/>	
ALLOCATED WEIGHT (Weight estimate agreed by purchaser and supplier based on order specs).		<input type="text"/>	
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	

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	66 of 74

ANNEXURE '10'

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

- 1) Technical Specification of the equipment's.
- 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 2 year and 5 years operation respectively)
- 13) Manufacturers list of spares for installation & Commissioning.
- 14) Instrumentation List & Diagram.
- 15) Brief on integration of RO Plant 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.





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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.

3009

REV. NO.

01

DATE

07.12.2023

PAGE

67 of 74

MOTOR:

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



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

DESIGN ENGINEERING

YARD:16101

FIN STABILIZER

T.S.P. NO.

3009

REV. NO.

01

DATE

07.12.2023

PAGE

68 of 74

- 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

Class

of

insulation



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

DESIGN ENGINEERING
YARD:16101
FIN STABILIZER

T.S.P. NO.	3009
REV. NO.	01
DATE	07.12.2023
PAGE	69 of 74

Annexure-'11'

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) Referance/ Part No. of	Desc of Spare	Country of Origin	Unit Price	Seller Order No. & Date	Currency Code	Total Qty	VED* Category	Recommend ed 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) Referance/ 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)

	MAZAGON DOCK LTD., (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	T.S.P. NO.	3009
		YARD:16101	REV. NO.	01
		FIN STABILIZER	DATE	07.12.2023
			PAGE	70 of 74

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.



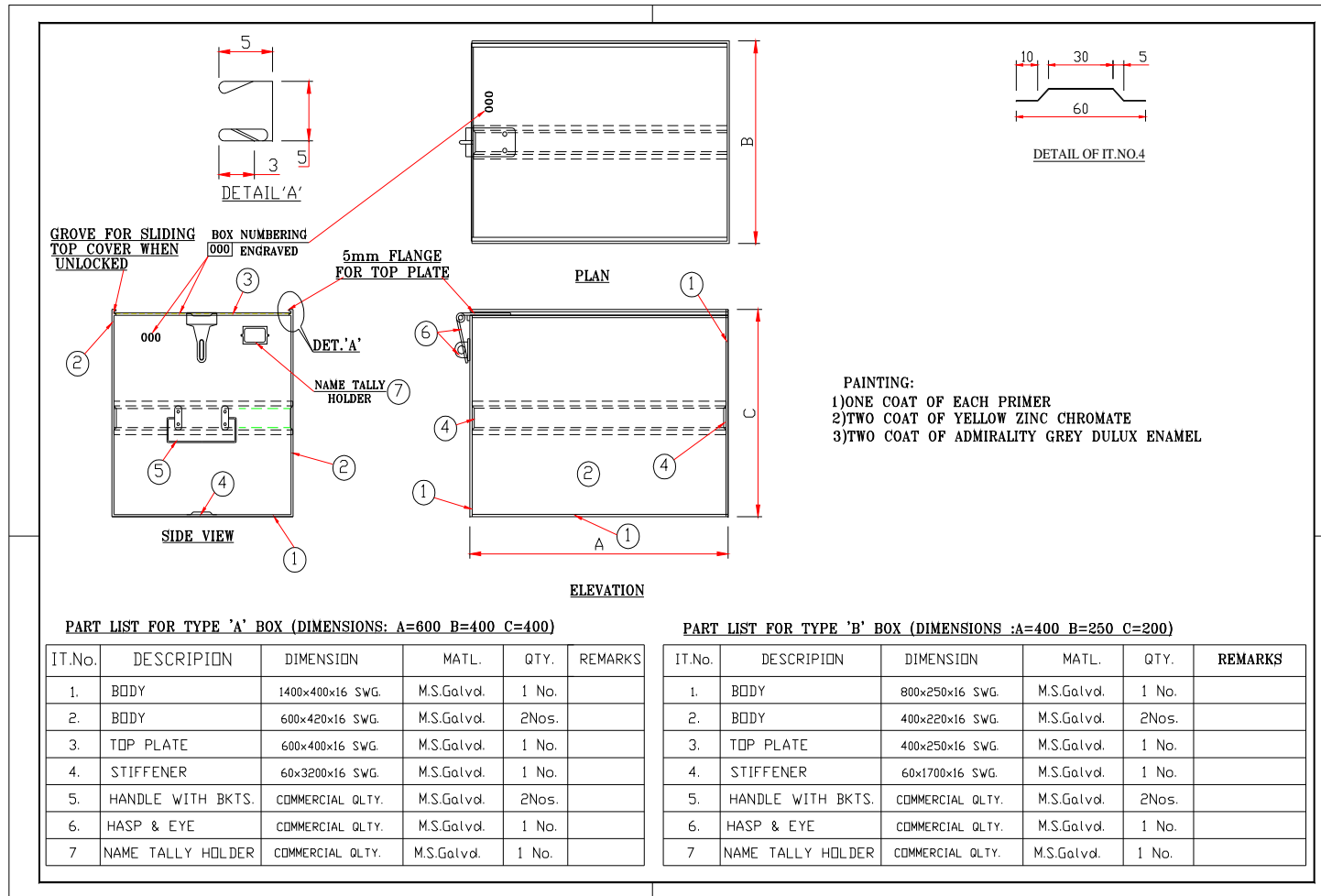


MAZAGON DOCK LTD.,
(A Govt. Of India Undertaking)
Dockyard Road, Mumbai -400 010.

DESIGN ENGINEERING
YARD:16101
FIN STABILIZER

T.S.P. NO. 3009
REV. NO. 01
DATE 07.12.2023
PAGE 71 of 74

Annexure-'12'
REFERENCE DRAWING FOR SPTA



BOX

Annexure '13'

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	



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

DESIGN ENGINEERING
YARD:16101
FIN STABILIZER

T.S.P. NO.	TS/STABILIZER
REV. NO.	00
DATE	04.12.2023
PAGE	73 of 74

Annexure "14"
TIMELINES FOR TASKS AND DELIVERABLES (DURATIONS)

FOR MDL				
Activity	Yard 16101			Duration (Weeks)
	From	To		
Placement of order				P
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
5 Equipment Supply				E
6 Documentation	As per SOTR			
7 Preservation				
(a) In Stores OR	As per SOTR			
(b) On- board				
8 Services of Engineers				
(a) Installation				
(b) STW				
(c) HATs	As per SOTR			
(d) SATs				
(e) For Routines				
(f) Training				
9 OBS for two years	As per SOTR			
10 Warranty	As per SOTR			
11 B&D Spares	As per SOTR			



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

DESIGN ENGINEERING
YARD:16101
FIN STABILIZER

T.S.P. NO.	TS/STABILIZER
REV. NO.	00
DATE	04.12.2023
PAGE	74 of 74

* - 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.