



MAZAGON DOCK SHIPBUILDERS LIMITED
(A Govt. Of India Undertaking)

SHIPBUILDING DESIGN ENGINEERING
DOCKYARD ROAD, MUMBAI - 400 010

STATEMENT OF TECHNICAL REQUIREMENTS
FOR
WATER JET SYSTEM


PROJECT	:	14 Nos FAST PATROL VESSELS (FPV)
YARD NOS MDL	:	16501/16502/16503/16504/16505/16506/16507/ 16508/16509/16510/16511/16512/16513/16514
CLIENT	:	INDIAN COAST GUARD
DOCUMENT NO	:	3002
ICG HQ REFERENCE / APPROVAL	:	
CLASSIFICATION NOTATION	:	+ A1 HSC (Special Government Service) +AMS or equivalent.

01	(i) Incorporation of ICG Comments provided vide letter SA/0160/14FPVs/Engg SOTR dated 04 Jun 2024 (ii) Incorporation of ICG Comments provided vide letter SA/0160/14FPVs/Engg SOTR dated 15 Apr 2024 (iii) Change in Scope of Technical Requirement (Clause 4.2.7)	06.06.2024	
00	First Issue	04.03.2024	-
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Prepared By	Checked By		Approved By


 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	2 of 56

CONTENTS

SR. NO.	DESCRIPTION	PAGE NO.
	SECTION I	5
	INTRODUCTION	5
	GENERAL CONDITIONS & REQUIREMENTS	6
1	Subject	6
2	Ship's Basic Particulars	6
3	Reference Environmental Conditions	6
4	Ship's Support Systems Supplies	7
5	Noise & Vibration	8
6	Noise Levels in Machinery Spaces	8
7	Vibration Isolators (Anti Vibration Mounts)	8
8	Electrical Equipment Requirements	8
9	Availability/ Reliability/ Redundancy/ Self Sufficiency	9
10	Documentation	9
11	Quality Assurance and Testing	13
12	Maintenance & Logistics	15
13	Spares	15
14	Indigenisation / Local Support	17
15	Product Support	17
16	Materials	18
17	Interchangeability	18
18	Tally and Diagram Plates	18
19	Instruction Plates	19
20	Painting Specification	19
21	Lifting Arrangement	19
22	Preservation / Conditioning	19
23	Packing & Shipping	19
24	Training	20
25	Security of Information	20
26	Warranty	20
27	Planned Ship Delivery date(D)	22
28	Weight Recording / Weight Certificate	22
29	Maintenance Management Software	22
30	Technical Assistance	23
31	Receipt Inspection	23
32	Price	23
33	Compliance Matrix	24
34	Technical Offer as Per Shipyard Tender	24
35	Instrumentation	25
	SECTION II	26
	TECHNICAL REQUIREMENT	26
1	Technical Specifications	26
2	The make and model of the water jets	26
3	Ship's Speed & Guaranteed thrust	26
4	Technical requirements	27
	ANNEXURES	
1	GENERAL POINTS FOR MOTORS AND STARTERS	39
2	DEVIATION LIST	44
3	WEIGHT CONTROL DATA SHEET	45

 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	3 of 56

SR. NO.	DESCRIPTION	PAGE NO.
4	WEIGHT CERTIFICATE	46
5	COMPLIANCE MATRIX	47
6	CHECKLIST WITH OFFER	48
7	MANUFACTURER'S RECOMMENDED LIST OF SPARES TOOLS AND SOFTWARE (MRL-OBS)	51
8	REFERENCE DRAWING FOR SPTA BOX	53
9	MAINTENANCE MANAGEMENT SOFTWARE (MMS) FORMAT	54
10	TIMELINES FOR TASKS AND DELIVERABLES (DURATIONS)	55
11	CRITICAL DIMENSIONS FOR WATERJET	56

 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	4 of 56

ACRONYMS

CPP	-	Controllable Pitch Propellers
DE	-	Diesel Engine
DER	-	Diesel Engine Room
FATs	-	Factory Acceptance Trials
HATs	-	Harbour Acceptance Trials
HPU	-	Hydraulic Power Unit
IMCS	-	Integrated Machinery Control 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
FPV	-	Fast Patrol Vessel
WJ	-	Water Jet



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DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

5 of 56

**SECTION I
INTRODUCTION**

Sl. No.	Description	Remarks
i.	This General Specifications relate to Design, approval of the equipment by the classification society, Manufacture and Supply of 14 (fourteen) ship set of Equipment for Project "Fast Patrol Vessel (FPVs)" of Indian Coast Guard.	
ii.	Project 14 FPVs consist of Water Jet propulsion comprises of three propulsion plants, each plant consisting of one Diesel Engine driving Water Jet propulsion through Reversible Reduction Gearbox and respective shaft line. Each propulsion plant broadly comprises of:	
(a)	One Diesel Engine of minimum 2800 KW power output.	
(b)	One Reversible Reduction Gearbox with built in thrust bearing.	
(c)	One set of shafting along with associated components	
(d)	One Water Jet propulsion	
(e)	Propulsion plant support systems (for Diesel engines, Gear box, Water Jet propulsion and & shafting)	
(f)	Associated Controls & Monitoring System.	
iii.	Class notation for Fast Patrol Vessel (FPV) is: +A1 HSC(Special Government Service) + AMS or equivalent	
iv.	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.	
v.	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.	
vi.	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)	
vii.	The list of indigenous lube oil / hydraulic oil to be furnished.	
viii.	Product support viz. details of service centres, level of product support infrastructure in India or abroad, number of service engineers, and future expansion plan in India.	
ix.	Class : IRS & ABS	



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YARD 16501 - 514

WATER JET SYSTEM

SOTR No.

REV. NO.

DATE

PAGE

3002

01

06.06.2024

6 of 56

**SECTION I
GENERAL CONDITIONS & REQUIREMENTS**

SI. No	Description	Remarks																															
	GENERAL CONDITIONS & REQUIREMENTS																																
1.	<p>Subject The general conditions and requirements specified in this chapter are intended to meet the functional requirements of a FPV for operation in oceans environment and performance of all the ICG charter of duties. The vessel shall be capable for operation on Maritime zones of India and around island territories in depths greater than 3.5 meters.</p>																																
2.	<p>Ship's Basic Particulars The role of FPV class of ships would be Coastal and offshore Patrolling, Interception, Fisheries Protection and Monitoring, Control and Surveillance, Anti-Smuggling and Anti-Piracy, Search and Rescue, Medical evacuation, Logistic support etc. Ship's basic particulars are indicated below,</p> <table border="1"> <thead> <tr> <th colspan="2">PARTICULARS</th> <th>REFERENCE DATA</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Ship's dimensions</td> <td>Length overall (LOA)</td> <td>50-55 m (approx.) including water jet</td> </tr> <tr> <td>Beam (water line)</td> <td>7.84 m (approx.)</td> </tr> <tr> <td>Draft (deep displacement)</td> <td>2.0 m (approx.)</td> </tr> <tr> <td>Ship's displacement</td> <td>Deep displacement</td> <td>341 Tonnes (approx.)</td> </tr> <tr> <td>Endurance</td> <td>At cruising speed of 14 knots</td> <td>1500 NM</td> </tr> <tr> <td colspan="2">Expected ship's life</td> <td>20 Years at 2500 hrs of annual exploitation</td> </tr> <tr> <td rowspan="4">Operating profile</td> <td>10% time</td> <td>Below 08 knots</td> </tr> <tr> <td>50% time</td> <td>08 to 14 knots</td> </tr> <tr> <td>20% time</td> <td>Greater than 14 knots and up to 20 knots</td> </tr> <tr> <td>20% time</td> <td>Greater than 20 knots</td> </tr> <tr> <td colspan="2">Unrestricted continuous rating of Diesel engine, at 45 degree centigrade ambient temperature</td> <td>Min 2800 KW</td> </tr> </tbody> </table>	PARTICULARS		REFERENCE DATA	Ship's dimensions	Length overall (LOA)	50-55 m (approx.) including water jet	Beam (water line)	7.84 m (approx.)	Draft (deep displacement)	2.0 m (approx.)	Ship's displacement	Deep displacement	341 Tonnes (approx.)	Endurance	At cruising speed of 14 knots	1500 NM	Expected ship's life		20 Years at 2500 hrs of annual exploitation	Operating profile	10% time	Below 08 knots	50% time	08 to 14 knots	20% time	Greater than 14 knots and up to 20 knots	20% time	Greater than 20 knots	Unrestricted continuous rating of Diesel engine, at 45 degree centigrade ambient temperature		Min 2800 KW	
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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	<p>The equipment is to be designed for continuous operation & survival under the environmental conditions specified for ambient conditions as specified table below</p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Design Parameter</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>(a)</td> <td>Air Temperature</td> <td>Maximum of 45 deg C</td> </tr> </tbody> </table>	Sr. No.	Design Parameter	Value	(a)	Air Temperature	Maximum of 45 deg C																										
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YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

7 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

Sl. No	Description	Remarks																				
	<table border="1"> <tr> <td>(b)</td> <td>Sea water temperature</td> <td>32 deg C</td> </tr> <tr> <td>(c)</td> <td>Relative humidity</td> <td>90% at 35 deg C</td> </tr> <tr> <td>(d)</td> <td>Atmospheric pressure</td> <td>750 mm of Hg column (1000mbar)</td> </tr> </table>	(b)	Sea water temperature	32 deg C	(c)	Relative humidity	90% at 35 deg C	(d)	Atmospheric pressure	750 mm of Hg column (1000mbar)												
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3.3	<p>Seaway Conditions: Seaway conditions are defined at a sea water temperature of 1 to + 32 Deg. C, Ambient air temperature of up 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:- The vessel shall be capable of operating in sea conditions up to and including sea state 4 and have sea worthiness and survivability up to sea state 6</p>																					
3.4	<p>Complement:</p> <table border="1"> <tr> <td>(a)</td> <td>Officers</td> <td>07</td> </tr> <tr> <td>(b)</td> <td>Subordinate Officers</td> <td>08</td> </tr> <tr> <td>(c)</td> <td>Others</td> <td>27</td> </tr> <tr> <td></td> <td>Total</td> <td>42</td> </tr> </table>	(a)	Officers	07	(b)	Subordinate Officers	08	(c)	Others	27		Total	42									
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	Total	42																				
3.5	<p>Propulsion Plant Operating Profile: The ship is to be available for exploitation for minimum of 2500 hrs. annual exploitation</p>																					
3.6	<p>Service life of ship: The expected service life of ship is 20 years @ 2500 hrs. annual exploitation</p>																					
4.	<p>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.).</p> <table border="1"> <thead> <tr> <th>Sr. No</th> <th>SYSTEM</th> <th>SUPPLIES</th> <th>REMARKS</th> </tr> </thead> <tbody> <tr> <td>(a)</td> <td>Fuel system</td> <td>Low sulphur high flash high speed diesel (LSHFHSD)</td> <td>Indian equivalent</td> </tr> <tr> <td>(b)</td> <td>Lube oil system</td> <td>Indian equivalent to be indicated by OEM</td> <td>Indian Oil Ltd HPCL, BPCL equivalent</td> </tr> <tr> <td>(c)</td> <td>Compressed air system</td> <td>High pressure air at working pressure of 30 bar & 30 cu m/hr. Suitable reduction available for working pressure at 30 bar & 7 bar.</td> <td>Any other pressure requirement shall be met by the equipment supplier.</td> </tr> <tr> <td>(e)</td> <td>Fresh</td> <td>Fresh water at 3 bar</td> <td>Specific</td> </tr> </tbody> </table>	Sr. No	SYSTEM	SUPPLIES	REMARKS	(a)	Fuel system	Low sulphur high flash high speed diesel (LSHFHSD)	Indian equivalent	(b)	Lube oil system	Indian equivalent to be indicated by OEM	Indian Oil Ltd HPCL, BPCL equivalent	(c)	Compressed air system	High pressure air at working pressure of 30 bar & 30 cu m/hr. Suitable reduction available for working pressure at 30 bar & 7 bar.	Any other pressure requirement shall be met by the equipment supplier.	(e)	Fresh	Fresh water at 3 bar	Specific	
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DESIGN ENGINEERING

YARD 16501 - 514

WATER JET SYSTEM

SOTR No.

REV. NO.

DATE

PAGE

3002

01

06.06.2024

8 of 56

**SECTION I
GENERAL CONDITIONS & REQUIREMENTS**

Sl. No	Description			Remarks																																	
	water system	(approx.) shall be provided by ship's fresh water system.	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.	Suitable flexible hoses, bellows and noise reduction clamps are to be used for associated piping connections with the main equipment/auxiliaries.																																				
5.3.	Noise and Vibration levels of the equipment shall meet the classification rules and guidelines.																																				
6.	<p>Noise Levels in Machinery Spaces Permissible noise levels in machinery spaces are to be in accordance ISO-6954:2000. The noise criteria laid down by IMO resolution A 468(XII) is to be taken as reference. The noise criteria for the compartments are as follows:</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Sr. No.</th> <th>Compartments</th> <th>dB (A)</th> </tr> </thead> <tbody> <tr><td>1.</td><td>Machinery spaces</td><td>110</td></tr> <tr><td>2.</td><td>MCR</td><td>75</td></tr> <tr><td>3.</td><td>Work places</td><td>85</td></tr> <tr><td>4.</td><td>Non Specific workshops</td><td>90</td></tr> <tr><td>5.</td><td>Bridge and Chartroom</td><td>65</td></tr> <tr><td>6.</td><td>Radio Rooms</td><td>65</td></tr> <tr><td>7.</td><td>Cabins</td><td>60</td></tr> <tr><td>8.</td><td>Dining Hall/Offices</td><td>65</td></tr> <tr><td>9.</td><td>Service spaces (galley, pantry)</td><td>75</td></tr> <tr><td>10.</td><td>Normally unoccupied spaces</td><td>90</td></tr> </tbody> </table>			Sr. No.	Compartments	dB (A)	1.	Machinery spaces	110	2.	MCR	75	3.	Work places	85	4.	Non Specific workshops	90	5.	Bridge and Chartroom	65	6.	Radio Rooms	65	7.	Cabins	60	8.	Dining Hall/Offices	65	9.	Service spaces (galley, pantry)	75	10.	Normally unoccupied spaces	90	
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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	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																																				



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REV. NO.

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WATER JET SYSTEM

DATE

06.06.2024

PAGE

9 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

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	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.																
10.	<p>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:</p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Documentation</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>(a)</td> <td>Binding design documentation</td> <td>For progressing with detailed design, integration & installation.</td> </tr> <tr> <td>(b)</td> <td>(i) Quality Assurance Plan (QAP) (ii) Equipment manufacturing/ production documentation (iii) Test and Trial procedure/ Reports</td> <td>For approval by ABS and IRS equipment quality assurance during production and Test & Trial accordingly.</td> </tr> <tr> <td>(c)</td> <td>Equipment STW/HATs/SATs documentation</td> <td>For preparing installation inspection/Test and trials documentation</td> </tr> <tr> <td>(d)</td> <td>Technical Manuals for equipment operation, maintenance, logistics, etc.</td> <td>For ship's crew, training and repair organizations.</td> </tr> </tbody> </table>	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	(d)	Technical Manuals for equipment operation, maintenance, logistics, etc.	For ship's crew, training and repair organizations.	
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(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:																
10.2.1	Documents, data & reports in MS-WORD/EXCEL, as applicable																
10.2.2	Orthographic drawings (2D) in DXF/DWG format																
10.2.3	3D model of external topography of the equipment only in AVEVA MARINE/.STP format of max size of 5 MB																
10.2.4	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. Three (03) sets of documentation for ships to be provided in CD-ROM and in printed hard copies as per guiding specifications																



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SOTR No.

REV. NO.

DATE

PAGE

3002

01

06.06.2024

10 of 56

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GENERAL CONDITIONS & REQUIREMENTS

SI. No	Description	Remarks																														
10.4	<p>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:</p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>DRAWINGS / DOCUMENTATION</th> </tr> </thead> <tbody> <tr> <td colspan="2">Level I : Submission within 02 weeks of placement of order by Shipyard</td> </tr> <tr> <td>(a)</td> <td>Technical description on main equipment along-with associated auxiliaries/components with operating principle</td> </tr> <tr> <td>(b)</td> <td>General arrangement drawing of equipment and major sub-assemblies along with footprint in 1:25 or appropriate scale</td> </tr> <tr> <td>(c)</td> <td> Assembly drawings of main & associated auxiliaries/components including:- <ul style="list-style-type: none"> • Main dimensions • Mounting arrangement (including details on vibration 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. </td> </tr> <tr> <td>(d)</td> <td>Equipment performance data</td> </tr> <tr> <td>(e)</td> <td>Characteristics data, curves, efficiency, etc., related to equipment performance</td> </tr> <tr> <td>(f)</td> <td>Heat emission data</td> </tr> <tr> <td>(g)</td> <td>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</td> </tr> <tr> <td>(h)</td> <td>Data/details for equipment foundation design and interfaces with ship structure</td> </tr> <tr> <td>(i)</td> <td>Any other design data/details, calculations, analysis, specifications, drawings, etc., as applicable</td> </tr> <tr> <td colspan="2">Level II : Submission within 03 weeks of placement of order by Shipyard</td> </tr> <tr> <td>(a)</td> <td>Equipment control & monitoring data/details along-with structured list of sensors, signals & instrumentation (including in-built sensors for online health condition monitoring)</td> </tr> <tr> <td>(b)</td> <td>Control & monitoring interface data/details for interface with other propulsion equipment and ship's IMCS</td> </tr> <tr> <td>(c)</td> <td>Electrical specifications & wiring diagrams for associated electrical components, local control panels, etc.</td> </tr> </tbody> </table>	Sr. No.	DRAWINGS / DOCUMENTATION	Level I : Submission within 02 weeks 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 vibration 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. 	(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 03 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 IMCS	(c)	Electrical specifications & wiring diagrams for associated electrical components, local control panels, etc.	
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MAZAGON DOCK SHIPBUILDERS LTD.
(A Govt. Of India Undertaking)
Dockyard Road, Mumbai –400 010.

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

11 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

Sl. No	Description	Remarks
	(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 <u>within 04 weeks</u> 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	
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 <u>within 15 days</u> after placement of equipment order, for approval of nominated classification society.	
10.5.2	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.	



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

DESIGN ENGINEERING

YARD 16501 - 514

WATER JET SYSTEM

SOTR No.

REV. NO.

DATE

PAGE

3002

01

06.06.2024

12 of 56

**SECTION I
GENERAL CONDITIONS & REQUIREMENTS**

Sl. No	Description	Remarks																							
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	<u>Technical Manuals for Equipment (Operation, Maintenance & Logistics)</u> : 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.																								
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MAZAGON DOCK SHIPBUILDERS LTD.
(A Govt. Of India Undertaking)
Dockyard Road, Mumbai –400 010.

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

13 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

Sl. No	Description	Remarks				
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Class certification						
11.	Quality Assurance and Testing Quality assurance and testing requirements, pertaining to this equipment should confirm to standard conditions of quality assurance of Nominated classification society as mentioned in Technical Requirement of this SOTR.					
11.1	Design Standards Following rules and regulations as applicable shall be met:					
11.1.1	Nominated Classification Society Class Rules.					
11.1.2	International load line reg. 1966 as amended by Protocol of 1988 and any other subsequent amendments.					
11.1.3	IMO/MARPOL-73/78 reg and any further / latest amendments including MS Act 58 and their rules.					
11.1.4	COLREG 72 and any further/ latest amendments.					
11.1.5	IMO /Anti Fouling System.					
11.1.6	International tonnage 1969 and any further/ latest amendments.					
11.1.7	SOLAS 1992 as amended in 2002 and any further / latest amendments.					
11.1.8	Stability standard as per NES 109.					
11.1.9	Naval Magazine Explosive Regulations (NMER).					
11.1.10	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					



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

14 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

SI. No	Description	Remarks
	(b) Construction : Shipyard at West Coast of India, MDL and CGRPT.	
	(c) Quality Control : Nominated Classification society	
	(d) Ship Trials : Indian Coast Guard/Shipyard/Nominated Classification Society.	
11.3	Quality Standard: During equipment production, any deviation to the QAP/finalized specifications/standards shall be brought to the notice of designated classification society and Shipyard/ICG, along with valid reasons and recommended solution, without any compromise on quality, reliability and performance of the equipment.	
11.4	FATs-(Factory Acceptance Trials)(Acceptance Test Procedure)ATP(QAP document)	
11.4.1	In order to verify its correct assembly and operation, each equipment, shall be subjected to Factory Acceptance Trials as per established proven engineering practice. A detailed FATs program and post-test inspections to demonstrate performance characteristics and guaranteed parameters of the equipment shall be prepared and submitted by the supplier for approval.	
11.4.2	All the parameters/performance required to be checked during HATs/SATs must be included in the FATs & duly noted.	
11.4.3	During Factory Acceptance Trials, the supplied equipment is to be installed on the test bed and operated in the same way as it will be on board the vessel. Any correction applied for different environmental and installation conditions shall be duly notified to Coastguard/shipyard seeking their approval.	
11.4.4	Factory Acceptance Trials shall be offered to, witnessed & accepted by ICG reps / Classification Society. The FATs shall also be witnessed by shipyard representative.	
11.4.5	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.	
11.4.6	All defects observed or developed during the inspection/ testing are to be rectified free of cost before dispatch to shipyard.	
11.4.7	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.	



MAZAGON DOCK SHIPBUILDERS LTD.

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

DESIGN ENGINEERING

YARD 16501 - 514

WATER JET SYSTEM

SOTR No.

3002

REV. NO.

01

DATE

06.06.2024

PAGE

15 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

SI. No	Description	Remarks
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.	
11.5.2	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.	
11.5.3	HATs/SATs shall be carried out to the satisfaction of ICG/ Classification society as per approved Test and Trial document.	
11.5.4	Noise and Vibration trials shall be conducted as desired by ICG team / CGRPT. Points for measurement of vibration limits shall be indicated by OEM.	
11.5.5	Supplier shall offer / assist HATs and SATs of respective equipment and attest the test and trial document forms on their successful completion.	
11.5.6	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	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 shall be supplied, in consultation with Shipyard/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.	



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

DESIGN ENGINEERING

YARD 16501 - 514

WATER JET SYSTEM

SOTR No.

REV. NO.

DATE

PAGE

3002

01

06.06.2024

16 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

SI. No	Description	Remarks
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.	
13.2.5	Special tools / Spares as per Class recommended to be submitted along with technical offer.	
13.3	On Board Spares (OBS):	
13.3.1	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.	
13.3.2	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".	
13.3.3	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.	
13.3.4	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".	
13.3.5	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.	
13.3.6	Firms quoting lesser Manufacturer's Recommended List of On-Board Spares in terms of range and depth will have to make good deficiencies at their cost without any financial responsibility or liability to ICG/MDL within 30 days of intimation to render equipment operational.	
13.3.7	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.	
13.3.8	The Manufacturer's Recommended List of On-Board Spares should also include the spare conforming to Classification Society rule requirements for the vessel.	
13.3.9	The seller would either BUY Back the spares rendered surplus or exchange them on cost to cost basis with the spares as required by the Buyer (ICG).	
13.3.10	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	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

17 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

Sl. No	Description	Remarks
	maintenance/overhaul requirements for 5 years including two refits and same to be supplied in three lots within delivery period of first and last ship	
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 to be supplied along with the offer with item wise cost and the quotation is to be valid for 18 month.	
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	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 20 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.	
15.1	The firm/OEM to submit undertaking to provide product support for minimum period of 20 years from date of delivery of the vessel.	
15.2	Undertaking for upgrade of software for all equipment's/ sub components for minimum 05 years from the date of delivery of ship. In case of obsolescence within 05 years from date of delivery of the ship, the same to be upgraded without any additional cost.	
15.3	Firm to indicate after sales and product support facilities in India with response time for attending defect and providing spares.	
15.4	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.	
15.5	Firm should agree to enter into the rate contract / All-inclusive Annual maintenance contract (AIAMC) with ICG for maintenance and supply of spares.	



MAZAGON DOCK SHIPBUILDERS LTD.

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

DESIGN ENGINEERING

YARD 16501 - 514

WATER JET SYSTEM

SOTR No.

REV. NO.

DATE

PAGE

3002

01

06.06.2024

18 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

Sl. No	Description	Remarks
15.6	Firm/OEM shall give the assurance that the supplied equipment is most modern and complaint to all latest regulations and shall not obsolete at least till 05 years from completion guarantee period of last ship of the class.	
15.7	Operational Cycle: The operating refit cycle of ship is as follows:	
15.7.1	1 st and 2 nd Ops refit cycle: Operation cycle of 24 months followed by a refit.	
15.7.2	3 rd and 4 th Ops refit cycle: Operation cycle of 18 month followed by a refit.	
15.7.3	Balance Ops and refit cycle – Operation cycle of 15 month followed by a refit.	
15.7.4	First three refits are short refit (SR) followed by a normal refit (NR). Second NR will be medium repair (MR).	
15.7.5	Short refit is for duration of 03 months, Normal refit is for duration of 04 months and medium refit for duration of 06 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	<u>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.</u>	
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 and same to be secured on the motor.	
18.2	Motor details such as HP (kW), Starting Current, Full Load Current, rpm, Insulation, Weight, Maker's Name, Sr. No. of Machine, Year of Manufacturing etc. shall be given in the motor tally plate.	
18.3	Danger labels in Red colour with white lettering are to be provided on all electrical equipment operating on 150Volts or higher	
18.4	Motor winding terminals ending at Connection Box shall have engraved tally number.	
18.5	The diagram plate, which is fixed on the rear side of the front door, shall have complete wiring diagram of the starter with sub-component identification number.	

 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	19 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

Sl. No	Description	Remarks
	The same identification number shall be engraved on the components fitted on the starter.	
18.6	Internal Cable-Cores terminating at the connection terminal strip shall have the same corresponding terminal ferrule no. Fixed / fitted on it.	
18.7	Tally of JB/Panel and other equipments internal diagram plate to be prepared by OEM.	
18.8	Cable Tallies as per approved system drawing to be prepared by OEM.	
18.9	Cable tallies should be supplied for both the ends.	
19.	Instruction Plates Instruction plates listing the starting/shut-down procedure and precautions in brief are to be prominently displayed on the equipment. The Instruction plates are to be SS/ chrome plated. Equipment is to be supplied with a set of instruction plates duly mounted on equipment or supplied loose.	
20.	Painting Specification 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. 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.	
22.2	Equipment shall be supplied with Initial preservation for a <u>period of 12 months</u> 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.	
22.4	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 with caution marks and protected with supports to ensure adequate protection during all methods of transportation.	
23.2	A separate document giving complete details & instruction for storage,	

	MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
		YARD 16501 - 514	REV. NO.	01
		WATER JET SYSTEM	DATE	06.06.2024
			PAGE	20 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

SI. No	Description	Remarks
	preservation, handling & transportation after delivery shall be supplied & a copy must be included with the shipping document.	
23.3	The instrumentation, sensors and meters etc. which are fitted on the equipment are to be removed from the equipment and shall be delivered in a separate suitable box/packing.	
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	
24.1	The equipment supplier is to impart training, to ship's crew, on aspects related to operation, installation, maintenance and repair of the equipment.	
24.2	For imparting training, complete training package in hard & soft form (including suitable training material, docket, computer based aids, etc.), is to be provided by the supplier to the participants.	
24.3	Training would be conducted by the equipment supplier at Shipyard/ On-board Ship. Training plan will be submitted by the equipment supplier, along with the technical offer. Training is required to cover the following aspects (but not limited to):	
24.3.1	Design and installation	
24.3.2	Operation and trouble shooting	
24.3.3	Control & monitoring	
24.3.4	Upkeep and routine maintenance	
24.3.5	On board maintenance including major repairs and overhaul	
24.3.6	The vendor has to arrange Water-jet Maintenance Training for 06 nos of Ship Crew member / ICG rep. /Shipyard rep. for 2 Weeks at OEM's premises. The expenditure on boarding, lodging & travel of ICG reps for equipment training at OEM premises shall be borne by ICG/MDL.	
25.	Security of Information The information contained in this document is not to be divulged to any other firm/third party without the prior permission of the Indian Coast Guard and MDL. Adequate measures are to be taken to ensure safe custody of this document.	
26.	Warranty	
26.1	The equipment along with associated auxiliaries/components shall be warranted	



MAZAGON DOCK SHIPBUILDERS LTD.

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

DESIGN ENGINEERING

YARD 16501 - 514

WATER JET SYSTEM

SOTR No.

3002

REV. NO.

01

DATE

06.06.2024

PAGE

21 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

Sl. No	Description	Remarks
	by the equipment supplier for the stipulated performance for a period of twelve (12) 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'.	
26.2	During the said period, 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.	
26.3	If within the period of warranty, the ship and (or) stores and (or) spares are reported by the Shipyard to have failed to perform as per the specifications, the Supplier 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.	
26.4	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.	
26.5	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.	
26.6	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 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.	
26.7	If the associated equipment and service, spares of 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.	
26.8	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	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

22 of 56

**SECTION I
GENERAL CONDITIONS & REQUIREMENTS**

Sl. No	Description	Remarks																																													
	goods/stores shall be extended to that extent.																																														
26.9	The Supplier warrants that the ship, the associated equipment and service supplied will conform to the Temperature and Humidity conditions as mentioned in this document.																																														
26.10	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.																																														
26.11	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.	<p>Planned Ship Delivery date(D) The planned date for delivery of the Ships to the Indian Coastguard by MDL are tabulated below:</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Ship No.</th> <th>Yard No.</th> <th>Planned Delivery Date</th> </tr> </thead> <tbody> <tr><td>1.</td><td>16501</td><td>Mar-2026</td></tr> <tr><td>2.</td><td>16502</td><td>Jun-2026</td></tr> <tr><td>3.</td><td>16503</td><td>Sep-2026</td></tr> <tr><td>4.</td><td>16504</td><td>Dec-2026</td></tr> <tr><td>5.</td><td>16505</td><td>Mar-2027</td></tr> <tr><td>6.</td><td>16506</td><td>Jun-2027</td></tr> <tr><td>7.</td><td>16507</td><td>Sep-2027</td></tr> <tr><td>8.</td><td>16508</td><td>Dec-2027</td></tr> <tr><td>9.</td><td>16509</td><td>Mar-2028</td></tr> <tr><td>10.</td><td>16510</td><td>Jun-2028</td></tr> <tr><td>11.</td><td>16511</td><td>Sep-2028</td></tr> <tr><td>12.</td><td>16512</td><td>Dec-2028</td></tr> <tr><td>13.</td><td>16513</td><td>Mar-2029</td></tr> <tr><td>14.</td><td>16514</td><td>Jun-2029</td></tr> </tbody> </table>	Ship No.	Yard No.	Planned Delivery Date	1.	16501	Mar-2026	2.	16502	Jun-2026	3.	16503	Sep-2026	4.	16504	Dec-2026	5.	16505	Mar-2027	6.	16506	Jun-2027	7.	16507	Sep-2027	8.	16508	Dec-2027	9.	16509	Mar-2028	10.	16510	Jun-2028	11.	16511	Sep-2028	12.	16512	Dec-2028	13.	16513	Mar-2029	14.	16514	Jun-2029	
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28.	<p>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.</p>																																														
28.1	Net weight of each component is to be recorded in presence of designated inspection authority and the weight certificate is to be submitted by the equipment supplier, along with equipment supply. Format for weight certificate, is placed at Annexure "4" of this document.																																														
28.2	The supplier shall have to submit, reasons for variation between allocated weight and actual/certified weight for each and every item, wherever applicable, to Coast Guard and MDL for their consideration and further necessary action.																																														
29.	<p>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</p>																																														

 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	23 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

Sl. No	Description	Remarks
	commissioned.	
29.1	The software package shall be capable of indicating Maintenance Routines falling due on various equipment fitted on-board and spares requirement, as per OEM promulgated schedule.	
29.2	The software will be capable of interlinking on-board spares with actual spares requirement and indicate future requirement to meet Minimum stock level.	
29.3	OEM is required to submit the inputs such as routine schedule, spare requirement etc. in the format enclosed at Annexure "9"	
30.	Technical Assistance	
30.1	The Supplier shall provide the necessary representative(s) as and when required , in carrying out inspection and supervise the work that is done on the equipment, during the following phases:	
30.1.1	Preparation for installation of equipment by shipyard.	
30.1.2	Monitoring of proper equipment preservation during storage.	
30.1.3	On-board erection and alignment.	
30.1.4	Setting to Work (including fitment of latest calibrated instrumentation).	
30.1.5	Harbour Trials.	
30.1.6	Assistance in trouble shooting.	
30.1.7	Customer Sea Trials	
30.1.8	Post CST equipment Inspections.	
30.1.9	Final Machinery Trials.	
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	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE


06.06.2024

PAGE

24 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

Sl. No	Description	Remarks
	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 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	

 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
		DATE	06.06.2024
	WATER JET SYSTEM	PAGE	25 of 56

SECTION I
GENERAL CONDITIONS & REQUIREMENTS

Sl. No	Description	Remarks
	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 certificate (if any).	
34.30	Manufactures may be guided by this document to ensure that their products meet the standards of Installation on Indian coast guard ship.	
34.31	The drawing & dimensions are for reference purpose only. Vendor to design the equipment based on technical data supplied.	
34.32	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).	
34.33	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.	
34.34	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.	
34.35	Any clarification required regarding Technical Specification / Requisition should be sought before submission of the offer.	
35.	Instrumentation	
35.1	Safety, control and monitoring devices are to be fitted on equipment as per requirement.	
35.2	Any other instrumentation & 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 isolating 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 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.	
35.5	All the gauges should have a valid calibration certificate with minimum of 6 months validity at the time of supply. In addition, the gauges are to be re-calibrated twice during STW & CST without any additional cost.	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

26 of 56

**SECTION II
TECHNICAL REQUIREMENT**

Sl. No.	Description	Remarks																		
1.	Technical Specifications																			
1.1	This statement of technical requirement (SOTR) relates to the design, manufacture, supply, installation, commissioning, test and trials of class approved Waterjet complete with associated auxiliaries and stern gear arrangement (three sets per ship and in total for fourteen ships.																			
1.2	The complete water jet including intake, transition duct and intake screen shall be provided by the manufacturer.																			
1.3	The manufacturer shall provide all information required for integration of the equipment on board the ship.																			
1.4	The equipment shall be designed and constructed so that it can be fully integrated with the subsystem to which it interfaces.																			
1.5	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.																			
1.6	The OEM shall be responsible to interface the water jet system with Gear Box.																			
1.7	The OEM shall be responsible in totality, on turn-key basis for undertaking detailed design, manufacture, test and supply of Class approved water jet and steering gear arrangement, as stipulated in this SOTR.																			
1.8	OEM has to provide every information required by supplier of Engine and Gear Box.																			
1.9	OEM representative must be available at the time of shaft installation and guide Yard team for alignment of shaft and interfacing with Gear Box. FPVs will build at different shipyard along the WEST coast of INDIA.																			
1.10	Its OEM responsibility to ensure desire performance the system. OEM has to take required data/information to get optimum performance from Gear box and Engine suppliers before commencement of production.																			
2	<p>The make and model of the water jets</p> <p>Based on indian Coast Guard requirements, the selected Model with respect to manufacturer are as below</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Sr. No.</th> <th>Manufacturer</th> <th>Model No.</th> </tr> </thead> <tbody> <tr> <td>(i)</td> <td>MJP</td> <td>MJP750</td> </tr> <tr> <td>(ii)</td> <td>Hamilton</td> <td>HT810</td> </tr> <tr> <td>(iii)</td> <td>Wartsila</td> <td>WXJ720SR</td> </tr> <tr> <td>(iv)</td> <td>Kongsberg</td> <td>S71-4</td> </tr> <tr> <td>(v)</td> <td>L&T</td> <td>LT850/ LT950</td> </tr> </tbody> </table>	Sr. No.	Manufacturer	Model No.	(i)	MJP	MJP750	(ii)	Hamilton	HT810	(iii)	Wartsila	WXJ720SR	(iv)	Kongsberg	S71-4	(v)	L&T	LT850/ LT950	
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(iv)	Kongsberg	S71-4																		
(v)	L&T	LT850/ LT950																		
3	<p>Ship's Speed & Guaranteed thrust</p> <p>Firm to confirm that Waterjets will provide sufficient thrust to achieve the speed not less than 33 knots with all three engines running at 92% MCR with 3 waterjets. The required power from the engine shall not exceed 3200 KW to deliver the required thrust considering applicable sea and design margins. Firm to indicate thrust of waterjets in the technical offer. In case, the supplied Water Jet does not perform as per the requirement brought out in this SOTR,</p>																			



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

27 of 56

**SECTION II
TECHNICAL REQUIREMENT**

Sl. No.	Description	Remarks																								
	the firm has to undertake corrective action as required without any financial implication to MDL.																									
4	Technical requirements																									
4.1	<p><u>Overall view of Propulsion System</u></p> <p>(a) The main propulsion system consists of three independent High Speed marine diesel engines and each engine shall be driving individual waterjet through a marine reversible reduction gearbox with built in clutch. The engine power at 100%MCR shall be in the range of 2800- 3200 kW. The ship shall be propelled at a maximum speed of not less than 33 knot @ 92% MCR with environmental condition specified in Section-1. The propulsion equipment should be suitable for marine use & have to meet operating profile of the ship as specified in Section-1.</p> <p>The hydraulic and lubrication system of the water jet installation will be driven by a hydraulic pump/ lub oil pump of the required capacity mounted on the PTO on the respective main engine/ gear box/ as per OEMs recommendation. Additional requirements, if any, for the successful operation of the water jet to be indicated by OEM.</p> <p>The vessel is to be designed and constructed for water jet propulsion, driven by marine diesel engine located around mid-ship.</p> <p>(b) Gear box ratio: To be decided based on required Shaft RPM (Water Jet) and Engine RPM.</p> <p>(c) Waterjet particulars: Following information to be provided by Vendors in technical offer:</p> <table border="1"> <tr> <td>(i)</td> <td>Type of waterjet unit</td> <td></td> </tr> <tr> <td>(ii)</td> <td>WaterJet power per unit</td> <td></td> </tr> <tr> <td>(iii)</td> <td>Water jet speed (max.) SRPM and direction</td> <td></td> </tr> <tr> <td>(iv)</td> <td>Thrust characters Curve, superimposed on vessel resistance, showing power demand and RPM across the entire speed regime.</td> <td></td> </tr> <tr> <td>(v)</td> <td>Curve for Power, Shaft Speed vs Flow rate & Thrust from Waterjet System.</td> <td></td> </tr> <tr> <td>(vi)</td> <td>Water Jet Characteristic Curves in following Mode including Power absorbed and speed achieved for unlimited hourly operation (i) 3 X Shaft Engaged (ii) 1 X Shaft Engaged and 2 Shaft Trailing (iii) 2 X Shaft Engaged and 1 Shaft Trailing</td> <td></td> </tr> <tr> <td>(vii)</td> <td>No. of blades and stators of waterjet impeller</td> <td></td> </tr> <tr> <td>(viii)</td> <td>Serial link & hardwired signals from Waterjet along with control philosophy. Firm to also to indicate critical hard-wired signals. These Hardwired signals will be required to control & monitor the waterjets in case of un-availability IMCS network.</td> <td></td> </tr> </table>	(i)	Type of waterjet unit		(ii)	WaterJet power per unit		(iii)	Water jet speed (max.) SRPM and direction		(iv)	Thrust characters Curve, superimposed on vessel resistance, showing power demand and RPM across the entire speed regime.		(v)	Curve for Power, Shaft Speed vs Flow rate & Thrust from Waterjet System.		(vi)	Water Jet Characteristic Curves in following Mode including Power absorbed and speed achieved for unlimited hourly operation (i) 3 X Shaft Engaged (ii) 1 X Shaft Engaged and 2 Shaft Trailing (iii) 2 X Shaft Engaged and 1 Shaft Trailing		(vii)	No. of blades and stators of waterjet impeller		(viii)	Serial link & hardwired signals from Waterjet along with control philosophy. Firm to also to indicate critical hard-wired signals. These Hardwired signals will be required to control & monitor the waterjets in case of un-availability IMCS network.		
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MAZAGON DOCK SHIPBUILDERS LTD.
(A Govt. Of India Undertaking)
Dockyard Road, Mumbai -400 010.

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

28 of 56

**SECTION II
TECHNICAL REQUIREMENT**

Sl. No.	Description	Remarks
	(ix) Maneuvering time of the water jet from 30 deg port to 30° Stbd and From full ahead to full astern and vice versa to be indicated.	
4.2	<u>Design and Supply</u>	
4.2.1	Design overview of waterjets (a) The water jet including shafting, thrust bearing, shaft bearings and coupling shall be designed and supplied to achieve 33 knot @ 92% MCR for the ship with three water jet in operation and as per environmental condition specified in Section-1. (b) Waterjet supplier to clearly bring out the procedure to be followed in their technical offer for Water jet power demand / shaft rpm/flow rate/thrust at 8, 14, 20, and 33 kn speed and also at speed attained at 100% MCR of the Engine for acceptance of ICG/MDL. (c) <u>Critical dimensions for Waterjet:</u> (i) Annexure-11 shall be referred for critical dimensions for waterjet/shafting layout. (ii) Length of waterjet compartment (i.e transom bulkhead to compartment forward bulkhead) is approximately 5-6 meter (Annexure-11). (iii) Arrangement of waterjet & shafting shall be decided/ selected considering compartments dimensions and installation/maintenance point of view. The same shall be finalized in consultation with MDL and Gearbox supplier during detail design. The firm shall interact with the MDL and Gearbox supplier for satisfactory connection of Waterjet shaft with the Gear Box. (d) All water jet auxiliaries including the hydraulics, coolers and hydraulic pump shall be fitted on/ near the water jet body / waterjet compt. A standby motor driven hydraulic pump shall be provided for emergency control in case of main hydraulic pump failure. The control of water jets shall be using digital controller interfaced with IMCS as stated in this SOTR. Remote control and monitoring of water jets shall be provided both from Bridge and MCR through IMCS. Back flushing of water jets shall be feasible by utilising the reversible gear box. Emergency control of waterjets shall be provisioned by the firm. (e) Astern thrust shall be achieved by reversing the discharge flow using a reversing bucket in the nozzle, directing the jets forward and backwards. (f) All the waterjets shall be steerable and shall be provided with oil lubricated / sea water lubricated bearings which also suitable for trailing operation of the equipment. The shaft sealing arrangement shall be axially split type and provided with inflatable seal for afloat renewal / repairs. The shafting and waterjet design shall take into consideration the low noise level targets for the ship. The impeller and impeller shaft be made of stainless steel. The type and material of sea water lubricated/oil lubricated bearings of water jets are to be	

 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	29 of 56

SECTION II TECHNICAL REQUIREMENT		
Sl. No.	Description	Remarks
	<p>of class approved.</p> <p>(g) Thrust bearing: The water jet shall be fitted with its own thrust bearing. Since the water jet would be fitted at the transom of the vessel, the requirement of strengthening the hull for absorbing the thrust shall be determined and indicated by the firm.</p> <p>(h) Design and supply of Inlet duct: The complete water jet including intake, transition duct and intake screen shall be designed and provided by the manufacturer and shall form part of the scope of supply. The correct design of the inlet duct is very essential for steady and uniform flow of water at the pump impeller inlet. The Water Jet pump operation shall be cavitation-free over the entire operating range. The material of duct shall be ABS Grade AH36 or equivalent. Grating to be provided in inlet duct and inlet duct to be of same material as hull.</p> <p>(i) Sacrificial anodes will be fitted to the water jet units to provide cathodic protection should have minimum life of 03 years.</p> <p>(j) The vendor in the technical offer shall clearly specify the design measures implemented in the water jet to avoid entrapment of sea weeds, ingress of mud/sand and consequential wear of impellers during shallow water operation.</p> <p>(k) Each water jet is to be operated by its own independent hydraulic system.</p> <p>(l) Shaft protection tube and shaft locking arrangement to be provided.</p> <p>(m) Equipment to be finally painted as per OEM standard after approval of paint scheme from ICG/class. Detail paint scheme, for pre-launch work and before delivery of the ship, to be submitted by OEM.</p> <p>(n) Analog local indication of steering & reversing should be accessible/ visible to the operating position for emergency manoeuvring.</p> <p>(o) Provision for back flushing/flushing of water jet inlet (to clear sea weeds etc) to be provided.</p> <p>(p) Water Jet to be supplied with zinc anodes to provide high level of cathodic protection in the jet, whatever the environment condition they are required to be in operational. These anodes are to be located throughout the jet/inlet duct and are to be backed up by regular maintenance regime to ensure that they are active in all time.</p> <p>(q) Impeller must have enough protection against corrosion either through improvised anodes or any other protective device/Method</p> <p>(r) Material of all outboard hydraulic pipe lines should be specified in technical offer</p> <p>(s) Emergency operating procedure to be engraved on separate brass plate and fitted in the compartment at suitable place.</p>	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

30 of 56

SECTION II
TECHNICAL REQUIREMENT

Sl. No.	Description	Remarks
4.2.2	<p><u>Design overview of shafting:</u></p> <p>(a) The intermediate shafting shall be designed to take maximum engine power when running ahead. The material of shaft shall conform to internationally accepted norms. All parts of the shafting shall be interchangeable between the vessels of this series.</p> <p>(b) Before starting the production of the shafting, torsional Vibration calculation shall be established for clearance of Classification Society.</p> <p>(c) All highly stressed parts of the shafting shall be delivered with material certificates and work tests established by the makers.</p> <p>(d) <u>Bulk head glands:</u> P&S shaft-line shall be passing through two watertight bulkheads while Centre shaft-line shall be passing through one watertight bulkheads. Bulkhead seal shall be fitted on the watertight bulkhead for preventing passage of water from the adjacent compartment in case of flooding. Bulkhead seal shall be split type, for facilitating ease in installation, maintenance and replacement. The outside diameter shall allow passage of shafts flanges. It should accommodate angular shaft displacement as well as transverse movements between shaft and bulkhead resulting from shock induced shaft and bulkhead flexure. The pad required between Ship's Bulkhead and Seal to be included in the scope of supply. Bulkhead seal shall be fire resistant (class A60). Bulk head glands are to be provided in halves with fasteners for installation. 02 set of bulkhead seals on each (P&S) shaft line and 01 set of bulkhead seals on Centre shaft line (i.e total 05 sets per ship) to be supplied by OEM. The bulkhead seals should be suitable to withstand air pressure test (APT) of the compartment.</p>	
4.2.3	<p><u>Design & calculation</u></p> <p>Following shall be undertaken by OEM and same to be wetted by Class. All these data are to be shared with IMCS vendor for generation of mathematical model in IMCS.</p> <p>a) Shaft diameter and strength calculations</p> <p>b) Calculation of bearing spans</p> <p>c) Whirling, axial, vibration calculations</p> <p>d) Shaft alignment calculations</p> <ul style="list-style-type: none">• Shaft stress/deflection analysis• Reaction influence numbers• Alignment conditions in slipway/dry dock conditions and in basin <p>e) Shafting noise & vibration analysis</p> <p>f) Shaft transmission losses</p> <p>g) Water jet – engine matching curve</p> <p>h) Prediction of cavitation inception speed based on model test result (with diagram showing cavitation buckets together with ship operating curve in Kt, s plane)</p> <p>i) Water jet details including waterjet efficiency & Performance prediction</p>	



MAZAGON DOCK SHIPBUILDERS LTD.

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

DESIGN ENGINEERING

YARD 16501 - 514

WATER JET SYSTEM

SOTR No.

3002

REV. NO.

01

DATE


06.06.2024

PAGE

31 of 56

**SECTION II
TECHNICAL REQUIREMENT**

SI. No.	Description	Remarks
	j) Any other relevant calculation & analysis as required by Class	
4.2.4	<p>Other design consideration</p> <p>(a) Reliability: Reliability shall be achieved by designing equipment, which is robust and simple. The equipment is to be designed for minimum maintenance and for ease of such essential maintenance as required; incorporating facilities to allow ease of visual inspection so that the internal components are not disturbed to the extent possible.</p> <p>(b) Operability under Power Outage: The design should cater for independent availability and operability of Waterjet under conditions of power outage and total blackout when the gear box is clutched-in and water jet is in operation.</p> <p>(c) Interchange ability: Interchange tolerance shall be such that all item parts having dimensions and characteristics permitted by the item specifications may be used as replacements without compromising from the equipment performance and shall be interchangeable between critical units.</p> <p>(d) Lifting Arrangement: All components weighting more than 40 kg are to be provided with eyebolts, where there is a danger of transit damage due to freedom of a dry rotor to move within its casing, a suitable jacking or rotor locking device is to be provided.</p> <p>(e) Interfacing Obligations: OEM to take care all the obligations and necessary action to overcome while interfacing with the other vendors.</p> <p>(f) Interface Design Document (IDD) shall be prepared by IMCS vendor in consultation with OEM, ICG and MDL. The IDD shall include list of hardwired and serial link signals along with protocol detail (Type of interface, Protocol type, sentence detail, Baud rate, Refresh rate etc.). The final IDD will be forwarded to all the stake holders (MDL, ICG, & Class) for their signature. The signed copy of the IDD will be forwarded to all the above stake holders and also to the OEMs for compliance, reference and record.</p> <p>(g) Weight: Total weight of the equipment along with OEM tolerance shall be indicated in the technical offer as well as on the GA drawing. In order to achieve maximum economy in weights, careful attention should be given to every part of the machinery and system with a view to limit its weight within tolerance (limiting $\pm 1\%$) without prejudicing its reliability and efficiency. The manufacturer/supplier of the equipment shall indicate net weight on the packing case(s) and test report(s)/ Third Party/ MDL QA/ Inspecting Authorities reports, which would be recorded. The inspection authorities should countersign all such weight certificates. Within four weeks of placement of order, accurate weights of parts of supply shall be supplied. The weight for the whole system inclusive of all three WJ must not exceed 12.5 tonne.</p> <p>(h) Assembly: The stern gear arrangement shall be of modular design to</p>	

	MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
		YARD 16501 - 514	REV. NO.	01
		WATER JET SYSTEM	DATE	06.06.2024
			PAGE	32 of 56

SECTION II		
TECHNICAL REQUIREMENT		
Sl. No.	Description	Remarks
	<p>facilitate easy dismantling, shipping, unshipping. The OEM is to indicate the dimension & weight of every component.</p> <p>(i) Shafting Efficiency: - Shafting losses should be minimized and kept as low as possible. The firm shall submit Shafting efficiency data and curves for all modes of operation.</p> <p>(j) Mechanical Interfaces: All mechanical interfaces for Shafting; with Gearbox, between shafting components and ship's structure shall be suitably adapted by Shafting/water jet supplier as per the design requirements, in consultation with Gearbox supplier and Shipyard/Indian Coast Guard. Design requirements for Shafting components foundation as applicable, shall be provided by Shafting supplier. Type approved Flexible hoses at all terminal points of vibrating equipment/items, inter unit pipe and pipe fittings (pipe flanges, couplings, elbows, mating flanges etc.), foundation bolts etc. are to be included in the scope of supply.</p>	
4.2.5	<p><u>Scope of supply</u></p> <p>Following is the minimum and indicative list of scope of supply. Actual scope of supply is to be indicated by the firm in technical offer in line with the minimum and indicative requirement. All items required for satisfactory performance of waterjet are to be included in firm's scope of supply.</p> <p>(a) <u>Waterjet units (3 sets/ship - P, S & C)</u></p> <p>The scope of supply shall include the following items:</p> <ol style="list-style-type: none"> i) Intake duct with interface piece for bottom hull and transom. The material of intake duct to be Steel to ABS grade AH36 or equivalent. ii) Water jet Pump with impellers and impeller chamber. Required oil lubricated bearings and seals integrated in pump unit. iii) Stainless steel impeller shaft. iv) Nozzle (material – Class approved) v) Reversing and steering actuating mechanism vi) Electro-hydraulic system for reversing and actuating mechanism, including Hydraulic pump, valves, power pack unit, Standby pump. vii) Thrust bearings integrated in WJ units viii) Plummer bearing (as and if applicable) ix) Shaft Seal x) Control interface panel. xi) Flexible pipes/pipes and pipe fittings for WJ unit, power pack and transom. xii) Cable and pipe glands on transom through put. xiii) Gearbox driven pumps and Motor driven pumps along with associated auxiliaries xiv) Starters for all electrical motors (Hydraulic PP and Lube Oil). xv) Feed-back transmitters for steering nozzle and reversing bucket xvi) Oil storage tank with level gauge (to comply class rule) xvii) Equipment to provisioned for grounding xviii) Digital flow meter and digital pressure gauge for shaft seal 	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

33 of 56

**SECTION II
TECHNICAL REQUIREMENT**

SI. No.	Description	Remarks
	<p>incorporating with MCS</p> <p>xix) Provision for monitoring inboard shaft bearing temperature in MCR & bridge</p> <p>xx) Inspection window is to be provided to enable the system for replacement of anode and other protective devices</p> <p>xxi) Water jet particulars, manoeuvring time of the water jet from 30 deg port to 30° STBD and from full ahead to full astern and vice versa to be indicated.</p> <p>xxii) Any other equipment, system required for satisfactory performance of the water jet.</p> <p>xxiii) Provision for interface (hardwired & Soft if applicable) with Remote Control & Monitoring through IMCS Consoles on Wheel House and MCR.</p> <p>(b) <u>Intermediate shafts (P. S & C):</u></p> <p>(i) Dimension of shaft: Exact shaft length of the shafts will be finalized during detail design with consultation with Gear box and engine suppliers however the approximate dimensions are as below</p> <ul style="list-style-type: none"> ➤ Port & Stbd shaft length 12 meter (approx.) each, ➤ Center shaft length 6 meter (approx) <p>(ii) Bulkhead seals – 02nos. each for P&S, 01 no. for C. The bulkhead seals should be suitable to withstand air pressure test (APT) of the compartment.</p> <p>(iii) Line bearings – Suitable no. of Plummer block bearings, if applicable, for each Shaft line. The number of Plummer bearings to be indicated in technical offer. Position of Plummer bearings shall be finalized in consultation with shipyard.</p> <p>(iv) All fasteners, holding down bolts/nuts, connecting hardware etc. required for installation of water jet unit and complete shafting.</p> <p>(v) Hand turning arrangement of impeller shaft.</p> <p>(vi) Hydraulic oil and Lub oil system (03 sets / ship) – Hydraulic and Lub oil system including all pumps (Electric and PTO driven as applicable), starters, power packs, header tank, valves, fittings, terminal box etc. for satisfactory operation of the system shall be supplied by the firm.</p> <p>(vii) Adaptors: Suitable adaptors, ferrules, nipples, etc as necessary are to be provided at the pipe connections of hydraulic power packs, water jets, coolers, PTO driven hydraulic pump, flexible hoses so that external pipes can be directly connected with the Equipment/items. All transom fittings for connection of pipes, cables shall also be supplied by the firm.</p> <p>(c) <u>Electrical panel and instrumentation</u></p> <ul style="list-style-type: none"> ➤ All control and monitoring at local, MCR & Wheelhouse, starter panel for LO, junction box etc. for water jet and shafting system ➤ Waterjet steering nozzle angle indicator and bucket position indicators to be provided in AER, FER position. ➤ All instruments, sensors, switches, gauges required for satisfactorily control, monitoring, safeties, alarm, interlocks, 	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

34 of 56

**SECTION II
TECHNICAL REQUIREMENT**

Sl. No.	Description	Remarks						
	<p>indication</p> <ul style="list-style-type: none"> ➤ Interfacing of the system with IMCS/Alarm monitoring system ➤ Interfacing with Auto Pilot and VDR (if required by the system) <p>Note: - The above list is only indicative. Any alterations and additions to the above list, which are considered necessary for satisfactory performance of the water jet propulsion system by the vendor, shall be included in the Firm's scope of supply.</p>							
4.2.5	<p><u>Water jet particulars</u></p> <p>The following details of the water jet and associated fittings are to be forwarded by the firm with the technical offer:</p> <ul style="list-style-type: none"> (i) Installation procedure to be provided along with offer (ii) The details of the hydraulic power system including Hyd. pumps, actuators etc. (iii) The details of motor driven pumps and their functionality are to be specified. The firm shall clearly indicate the auto cut-in /cut-out conditions of these motor driven pumps i.e. based on shaft speed/oil pressure etc. (iv) The details of hydraulic oil (Indian Equivalent). (v) The details of emergency standby pump and arrangements (vi) operation of water jets under conditions of emergency and power supply failure: (vii) Operation of reversing and steering mechanisms in case of failure of electric power supply (viii) Operation of reversing and steering mechanisms in case of failure of control power supply (ix) Operation of reversing and steering mechanisms in case of failure of hydraulic system (x) Details of indications available to the operator in case of above failures (xi) Position of steering gear and reversing mechanisms at the instant immediately after the above failures. (xii) Limitations in performance/ maneuvering ability etc. (if any) due to the above failures. (xiii) The details of pumps which are required to be driven by the gear box are to be included in the offer. Towards this, the water jet supplier shall closely interact with the gear box vendor for finalizing the interface details. The gear box driven pumps which are required for operation of water jet shall be supplied by the water jet vendor. The gear driven pump(s) would be required to be delivered to the gear box manufacturer for mounting the same before delivery of the gear box. The following details shall be indicated by the water jet vendor in the offer: <table border="1" data-bbox="411 1839 1326 1973"> <thead> <tr> <th data-bbox="411 1839 691 1910">Shaft Speed (RPM)</th> <th data-bbox="691 1839 1035 1910">Oil Pump Speed (RPM)</th> <th data-bbox="1035 1839 1326 1910">Oil Pump Flow (cubic m/ sec)</th> </tr> </thead> <tbody> <tr> <td data-bbox="411 1910 691 1973"></td> <td data-bbox="691 1910 1035 1973"></td> <td data-bbox="1035 1910 1326 1973"></td> </tr> </tbody> </table>	Shaft Speed (RPM)	Oil Pump Speed (RPM)	Oil Pump Flow (cubic m/ sec)				
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MAZAGON DOCK SHIPBUILDERS LTD.
(A Govt. Of India Undertaking)
Dockyard Road, Mumbai –400 010.

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

35 of 56

**SECTION II
TECHNICAL REQUIREMENT**

Sl. No.	Description	Remarks
	<p>(xiv) The operating range of the gear box driven pump shall be clearly indicated in the offer.</p> <p>(xv) The cooling water requirement (sea water), if any, i.e. flow rate, pressure etc. for satisfactory performance of water jets at various powers is to be indicated in the offer. The vendor shall note that the sea water temperature shall be as existing in tropical conditions and therefore the heat exchangers/coolers are to be designed and supplied accordingly.</p> <p>(xvi) The filters, which are used in the oil system, are to be of duplex type to enable cleaning of the same whilst the system is in operation.</p> <p>(xvii) The corrosion prevention measurements (corrosion due to sea water/environment) incorporated in the proposed water jets shall be elaborated in the technical offer.</p> <p>(xviii) The details of approval of the proposed model of the water jet by Classification Societies along with relevant certificates shall be forward as part of Technical offer.</p> <p>(xix) The details of engine-water jet matching at various operating speeds of the vessel shall be forwarded by the vendor in the technical offer, in tabulated and graphical formats. The water jet vendor shall guarantee that the proposed water jets would provide the required speed and acceleration of vessel without overloading the engines.</p> <p>(xx) The water jet vendor shall propose the 'throttle position versus thrust' curves for different ship speeds and forward the same as part of technical offer.</p> <p>(xxi) The basis of selection of the proposed water jet for the subject ship shall be detailed in the technical offer.</p> <p>(xxii) Since the water jet would be fitted at the transom of the vessel, the requirement of strengthening of the hull shall be clearly specified by the firm within two weeks of PO</p> <p>(xxiii) Minimum height between the water jet center line and bottom of transom.</p> <p>(xxiv) Detail dimensional drawing of Water Jets along with accessories including Transom flange, Bulkhead Seals, Plummer Bearings etc, in autocad format</p> <p>(xxv) Minimum distance between the center lines of two Water Jets to be kept for satisfactory installation and performance onboard.</p> <p>(xxvi) Total weight of Three Water Jets complete with all accessories including entrained water.</p> <p>(xxvii) List of Anti-collision measures/arrangements/software provided for Water Jet steerable nozzles.</p>	
4.2.7	<p><u>Controls, Alarms, Monitoring and Interfacing:</u></p> <p>(a) <u>Overview:</u> Water jet and stern gear system should be able to be controlled and monitored from the following locations:</p> <p>(i) Local Waterjet control and monitoring from Waterjet LCP in Water jet</p>	

 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	36 of 56

SECTION II TECHNICAL REQUIREMENT		
Sl. No.	Description	Remarks
	<p>compartment.</p> <p>(ii) Remote Bucket (ahead/astern) control both from MCR & Bridge stations</p> <p>(iii) Remote Hardwire control / helmsman control for Waterjet Steering from Bridge</p> <p>(iv) Emergency Bucket (ahead/astern) control and steering control from Waterjet compartment / Power pack (as applicable)</p> <p>(b) <u>Local Waterjet control and monitoring:</u> Firm will supply LCP for each waterjet for installation in Engine Room. The LCP will have provision for local control and monitoring (on display) of waterjet steering and Bucket (ahead/astern) movement. LCP shall have local/ remote selector switch for bucket control and steering control from remote station. Waterjet parameters/indications/alarms as per requirement of Class rule are also to be included in LCP. All necessary hardware, sensors, switches etc. for the local control /monitoring are to be included in firm's scope of supply. Local control panels must be provided with necessary mounts to meet vibration requirements stipulated in subsequent sections and to be suitable for bulkhead mounting.</p> <p>(c) <u>Remotely Bucket (ahead/astern) control both from MCR & Bridge:</u></p> <p>Water jet propulsion system along with Engine shall be controlled from following two control stations.</p> <ol style="list-style-type: none"> 1) MCR 2) Bridge/Wheelhouse <p>Details of the control features at MCR station for each water jet (total three in no. for each shipset) are as follows</p> <ol style="list-style-type: none"> 1)Lever for combined control of Engine Speed, reversing bucket position & steering/nozzle angle 2)Push buttons/joystick for non-follow up/back up control of engine speed, nozzle angle, bucket position 3)Indicating panels/display unit for speed, bucket position & nozzle angle feedback and alarm 4) Indicator for reversing bucket position and steering nozzle position 4)Push buttons for clutch operation, mode selection & station transfer 5)Lamp dimmer /lamp check facility 6)Remote Control system shall have provision of controlling all three water jets through any one lever <p>Details of the control features at wheel house/bridge station for each water jet are as follows</p> <ol style="list-style-type: none"> 1)Lever for combined control of Engine Speed, reversing bucket position & steering/nozzle angle 2)Push buttons/joystick for non-follow up/back up control of engine speed, nozzle 	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

37 of 56

**SECTION II
TECHNICAL REQUIREMENT**

Sl. No.	Description	Remarks
	<p>angle, bucket position</p> <p>3) Indicating panels/display unit for speed, bucket position & nozzle angle feedback and alarm</p> <p>4) Indicator for reversing bucket position and steering nozzle position</p> <p>4) Push buttons for clutch operation, mode selection & station transfer</p> <p>5) Lamp dimmer /lamp check facility</p> <p>6) Steering wheel for control of steering nozzle</p> <p>7) Remote Control system shall have provision of controlling all three water jets through any one lever</p> <p>Note:- Any other signals apart from above list as per OEM recommendation and Class requirement to be catered for completeness of Waterjet System.</p>	
4.2.8	<p>(a) <u>Hardware control / helmsman control for Waterjet Steering from Bridge</u></p> <p>A hardware control / helmsman control (01 set per ship for installation in Bridge) with hand wheel, tiller, mode selector switch etc., along with control of Waterjet steering shall be supplied by vendor for Bridge.</p> <p>(b) <u>Auto pilot</u></p> <p>Ship will be equipped with Auto Pilot system as a part of navigation package. Water jet system shall be interfaced with the ship installed auto pilot system. The Auto Pilot system is to achieve optimum course keeping at all ship speeds. However, detail interface signals/protocols will be finalised with due interaction with selected vendors of other systems complying all class requirements</p> <p>Note: - Any other signals apart from above list as per OEM recommendation and Class requirement to be catered for completeness of Waterjet System.</p>	
4.2.9	<p><u>Emergency Bucket (ahead/astern) control and steering control from Waterjet compartment / Power pack:</u></p> <p>Water jet emergency control includes control of both Bucket (ahead/astern) & Steering. There shall be a provision and arrangement of water jet emergency control in water jet compartment or on power pack to cater for the emergency control in case of power outage/failure of local and remote control. The supply of emergency control is in firm's scope and details to be indicated in the technical offer. During emergency operation, all the parameters required for the safe operation, control and monitoring to be displayed in the Water jet compartment.</p>	
4.2.10	<p><u>Instrumentation/ Alarm/ Trips/ Interlock:</u></p> <p>(a) Instrumentation /alarm/trips/interlocks to be provided for waterjet, as per OEMs recommendations. All Instrumentation shall be easily accessible for reading, maintenance and replacement. Instruments used for operation and monitoring should be mounted near to equipment for the convenience of the operator. Thermometers/ temperature gauges should be located to assure ease of temperature observation to obviate accidental breakage. Pressure gauges shall be installed as required for the safe operation and</p>	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

38 of 56

SECTION II TECHNICAL REQUIREMENT

Sl. No.	Description	Remarks
	<p>control of systems, equipment and shall facilitate easy readability from a distance. All gauges shall be grouped on common boards/ panels based on machinery being monitored or parameters being indicated. All gauges should be electrical or electronic type taking a feed from pressure, temperature, level or flow sensors. All gauges, indicators, sensors (both local & remote) shall meet Classification society requirement. All imported gauges & instrumentations shall meet class requirements. All gauges, sensors, electrical meters & overloads fitted are to be supplied duly calibrated and said calibration certificates are to be forwarded to MDL.</p> <p>(b) Following are indicative indications/parameters which are to be provided in LCP and to be interfaced with IMCS. The firm to indicate in their offer the list of recommended parameters for monitoring. The list should also comply ABS & IRS class requirement. The necessary hardware, sensors, switches etc. for control and monitoring from LCP, IMCS (from Bridge and MCR) & IBS as applicable are to be included in Firm's scope of supply.</p> <ul style="list-style-type: none">➤ Bucket Position indication➤ Steering position indication➤ Hydraulic oil temperature➤ Hydraulic oil pressure➤ Lube Oil pressure➤ Shaft lock engaged / disengaged➤ shaft support bearing temperatures➤ Water flow to shaft seal (as per OEM design)➤ Shaft seal air pressure (as per OEM design)➤ Shaft RPM➤ Lamp test push button➤ Power supply failure 24 V DC and 230 V AC➤ Torsion meter interface for shaft speed, torque & power <p>(c) Interlocks and Trips: Requirement of interlocks and trips as recommended by OEM to be indicated in technical offer. Necessary sensors/signals may be arranged by the firm & to be clearly brought out in technical offer. ICG will be the final authority to decide on the final list of indication, alarm, trips and interlocks.</p>	



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

DESIGN ENGINEERING

SOTR No. 3002

YARD 16501 - 514

REV. NO. 01

WATER JET SYSTEM

DATE 06.06.2024

PAGE 39 of 56

ANNEXURES

Annexure – 1

GENERAL POINTS FOR MOTORS AND STARTERS

Sl. No.	Description	Remarks
1.	Motors	
1.1	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.	
1.2	Motors shall be of standard squirrel cage continuous rated induction type.	
1.3	All Motors including Fractional HP motors shall be suitable for 415 Volts, 3 phase, 50 Hz AC supply.	
1.4	All Motors shall have class 'F' insulation and totally enclosed with minimum protection of IP-44.	
1.5	Motors fitted on the Weather Deck shall be of IP-56 and shall be provided with anti-condensation heaters.	
1.6	All motors of 50HP/37.5 KW and above shall be provided with space heaters.	
1.7	Interlock is to be provided on starter for switching off the space heater when the motor is switched ON.	
1.8	All motors weighing 20 Kgs, and above shall be provided with lifting eyebolts.	
1.9	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	
2.1	The electric cables shall enter the terminal box on the motor through glands, cable glands to be supplied along with the motor.	
2.2	Crippage distance of 20mm space for connecting the cables inside the terminal box should be provided.	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE

06.06.2024

PAGE

40 of 56

Annexure – 1
GENERAL POINTS FOR MOTORS AND STARTERS

Sl. No.	Description	Remarks
3.	General	
3.1	All motors of 13.5 HP/10 KW & above shall be provided start-Delta Starters or soft starters.	
3.2	Motors below 13.5 HP/10 KW shall be provided with direct on-line starters.	
3.3	Fractional HP motors shall be provided with suitable MCCBS/MCBs only.	
3.4	Starters to have current protection.	
3.5	Starters shall be provided with under voltage protection for motors above/ HP.	
4.	Electrical Supply	
4.1	The starter shall be suitable for 415 Volts, 3 Phase, 50Hz Ac supply.	
4.2	The starter shall be provided with Triple Pole Isolator Rotary type incomer.	
4.3	MCB/ MCCB.	
4.4	ON and OFF Push Buttons.	
4.5	Control fuses.	
4.6	Motor 'ON' LED indication for Local and remote(As applicable).	
4.7	Provision for Auto ON/OFF facility (As applicable).	
4.8	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.	
4.9	Provision for remote ON-OFF Facility.	
4.10	Spare NO/NC contacts for interfacing as required to be provided.	
4.11	KED indications with tallies for the following fault condition to be provided	
4.12	Single phasing	
4.13	Overload	
4.14	Thermister Over Heating, if applicable	



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

DESIGN ENGINEERING

YARD 16501 - 514

WATER JET SYSTEM

SOTR No.

3002

REV. NO.

01

DATE

06.06.2024

PAGE

41 of 56

Annexure – 1
GENERAL POINTS FOR MOTORS AND STARTERS

Sl. No.	Description	Remarks
4.15	Contactora with two potential free contacts (spare).	
4.16	Timer applicable	
4.17	Over Load Relay (85 to 150%).	
4.18	Provision of connecting anti-condensation heater/ space heater	
5.	Thermister and overload Protection	
5.1	The motor thermal protection system in the starter must detect the abnormal rise in temperature by means of positive temperature coefficient thermistors (PTCT). Motor should trip due to rise in temperature.	
5.2	Timer.	
5.3	It should have wide operating range, repeated accuracy and wide time setting.	
5.4	Electronic timers should be provided for Star-Delta application.	
5.5	Thermal timers to be provided for over lead protection.	
6.	Mechanical Construction	
6.1	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.	
6.2	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.	
6.3	The control panel shall be suitable for bulkheads/in-built eqpt mounting with necessary bolts, nuts, washers, vibration mount, screw less terminals etc.	
6.4	Suitable locking device will be provided for tixing screws and bolts for	



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

DESIGN ENGINEERING

SOTR No.

3002

YARD 16501 - 514

REV. NO.

01

WATER JET SYSTEM

DATE


06.06.2024

PAGE

42 of 56

Annexure – 1
GENERAL POINTS FOR MOTORS AND STARTERS

Sl. No.	Description	Remarks
	preventing them from loosening.	
6.5	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.	
6.6	The bottom plate shall be of removable type for cable entry through cable glands.	
6.7	Size of panel to be as small as possible considering space constrains on ship.	
7.	Cable Connections	
7.1	The electric cable shall enter the panel from bottom through glands, cable size will be indicated by MDL for supply of cable glands.	
7.2	The screw less connecting terminals shall be positioned at the bottom of the panel, with all the internal wiring terminated on one side.	
7.3	Crippage distance of 20mm space for connecting the cables inside the panel should be provided.	
7.4	10% spare terminals to be provided.	
7.5	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.	
8.	Internal Wiring	
8.1	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.	
8.2	All control and auxiliary wirings shall be provided with numbered ferrules at both the ends for easy identification.	
8.3	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.	
9.	Name Plate	

 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	43 of 56

Annexure – 1 GENERAL POINTS FOR MOTORS AND STARTERS		
Sl. No.	Description	Remarks
9.1	Name plate in English made from anodized aluminium (black) shall be provided for all devices in the panel to identify their function.	
9.2	Component tallies shall be provided for all the components inside the starter panel.	
9.3	Operating voltage tally shall be provided on the front top. Operating voltage tally shall be in red letters.	
10.	Painting Scheme	
10.1	Starter Panel to be painted with Polyester power coating of RAL-7032 paint.	
11.	Spares	
11.1	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.	
12.	Binding Drawings/Documentation	
12.1	General arrangement Drg. Of Motors and Starters including weight and dimension.	
12.2	Internal Wiring Diagram.	
12.3	Calibration Certificate for timers, Thermisters and Overload relays as applicable.	
13.	Trials	
13.1	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 MDL, as part of the Documentation.	
13.2	Tables of Relay Ranges, Fuses, MCBs, MCCB, Timers & SPP for Motor Protection.	



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

DESIGN ENGINEERING

SOTR No. 3002

YARD 16501 - 514

REV. NO. 01

WATER JET SYSTEM

DATE 06.06.2024

PAGE 45 of 56

Annexure - 3

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 SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	46 of 56

Annexure - 4

WEIGHT CERTIFICATE			
EQUIPMENT DESCRIPTION:		EQUIPMENT NO. :	
The form shall be completed by Supplier & shall be supplied along with the equipment.			
SUPPLIER'S NAME		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 SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	48 of 56

Annexure – 6 CHECKLIST WITH OFFER		
Sl. No.	Description	Remarks
1.	The supplier to supply as a minimum the following information along with his technical offer:	
1.1	Technical Specification of the equipment's.	
1.2	Details of all connections to equipment, Vibration details with pattern no, seat details, flange details etc.	
1.3	GA drawing of all equipment's, sub-assemblies & accessories.	
1.4	Technical parameters of all equipment & accessories.	
1.5	Outline drawings of the equipment indicating overall dimensions, C.G. and Maintenance envelope.	
1.6	P & ID and E&ID diagram.	
1.7	Complete Weight breakdown (excluding & including oil).	
1.8	Heat dissipation of the Equipment	
1.9	Details of other ship services required.	
1.10	Tools required for maintenance.	
1.11	Recommended onboard and base spares holding (for 3 year and 5 years operation respectively)	
1.12	Manufacturers list of spares for installation & Commissioning.	
1.13	Instrumentation List & Diagram.	
1.14	Brief on integration of DA Control System with ship's Integrated Control System.	
1.15	Inter-unit cabling diagram clearly indicating each unit/sub-unit and types of cables being used for the system.	
1.16	Requirement of Greases, Oils etc., with their equivalents.	
1.17	Proposed factory tests and Inspection plan.	
1.18	Proposed preservation plan.	
1.19	Delivery time from receipt of order.	
1.20	Clear demarcation between the scope of supply of firm and that of the yard.	
1.21	List of equipment required for installation and operation of the equipment and not supplied by the manufacturer.	
1.22	Trial and commissioning time of complete system on board.	

 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.	DESIGN ENGINEERING	SOTR No.	3002
	YARD 16501 - 514	REV. NO.	01
	WATER JET SYSTEM	DATE	06.06.2024
		PAGE	49 of 56

**Annexure – 6
CHECKLIST WITH OFFER**

Sl. No.	Description	Remarks
1.23	Special tools and test equipment to be supplied for on board maintenance.	
1.24	List of main equipment included in the standard scope of supply.	
1.25	List of accessories inclusive / not inclusive in the standard scope of supply.	
1.26	List of tools & accessories required for installation & commissioning	
1.27	Reliability parameters.	
1.28	User list of similar equipment supplied by the manufacturer.	
1.29	Details of standard and optional factory tests.	
2.	<u>MOTOR:</u>	
2.1	Service	
2.2	Type of motor	
2.3	Power supply – Voltage, Frequency & No. of phases	
2.4	Output of motor	
2.5	RPM (No load and full load)	
2.6	No. of poles	
2.7	Full load current	
2.8	Starting current	
2.9	Starting torque when the ambient temp. is 30oC	
2.10	Pull out torque	
2.11	Run up time	
2.12	Motor Enclosure & Protection provided	
2.13	Noise & Vibration level	
2.14	Class of insulation	
2.15	Method of starting – Remote, local facility & indication	
2.16	Type of winding	
2.17	Weight of the motor	
2.18	Over all dimensions of the motor	
2.19	Terminal connection detail	
2.20	Efficiency at 100%, 75% & 50%	
2.21	Power Factor at 100%, 75% load	



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

DESIGN ENGINEERING

YARD 16501 - 514

WATER JET SYSTEM

SOTR No.

REV. NO.

DATE

PAGE

3002

01

06.06.2024

50 of 56

**Annexure – 6
CHECKLIST WITH OFFER**

Sl. No.	Description	Remarks
2.22	Direction of rotation	
2.23	Shaft material	
2.24	Lifting arrangement of motor	
2.25	Whether RIS unit provided	
2.26	Whether heaters are fitted and supply voltage to heater is indicated	
2.27	Whether heater supply required	
2.28	Frame size	
2.29	Method of mounting	
2.30	Serial no of machine	
2.31	Duty cycle (period of output)	
2.32	Particulars of shaft end	
2.33	Heat dissipation	
3.	<u>STARTER</u>	
3.1	Service	
3.2	Type of starter	
3.3	Voltage, frequency and No. of phases	
3.4	Protection provided	
3.5	Enclosure	
3.6	Vibration level	
3.7	Method of mounting and requirement of mounts	
3.8	Method of starting, remote and local control	
3.9	Facilities and indication provided.	
3.10	Weight and overall dimensions of the equipment	
3.11	Rating of the contactors	
3.12	Spares provided	
3.13	Class of insulation	

 MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai -400 010.	DESIGN ENGINEERING		SOTR No.	3002
	YARD 16501 - 514		REV. NO.	01
	WATER JET SYSTEM		DATE	06.06.2024
			PAGE	51 of 56

Annexure - 7
MANUFACTURER'S RECOMMENDED LIST OF SPARES TOOLS AND SOFTWARE (MRL-OBS)

VESSEL/EQUIPMENT: 14 FAST PATROL VESSELS

Sr No	Eqpt Part No./ Model no./SI No.	Eqpt Description	OEM Name	Vendor Name	Illustrated Spare Part List (ISPL) Reference/ Part No. of	Desc of Spare	Country of Origin	Unit Price	Seller Order No. & Date	Currency Code	Total Qty	VED* Category	Recommended scale for 14 FAST PATROL VESSELS	Remarks

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

VESSEL/EQUIPMENT: 14 FAST PATROL VESSELS

Ser No	Eqpt Part No./ Model no./SI No.	Eqpt Description	OEM Name	Vendor Name	Illustrated Spare Part List (ISPL) Reference/ Part No. of Spare	Desc of Spare	Country of Origin	Unit Price	Seller Order No. & Date	Currency Code	Total Qty	VED* Category	Recommended scale for 14 FAST PATROL VESSELS	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)
 1. Data regarding maintenance spares/stores like lubricants, sealing compound, gases should be given separately giving source of supply.

	MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.		DESIGN ENGINEERING		SOTR No. 3002	
			YARD 16501 - 514	REV. NO. 01		
			WATER JET SYSTEM	DATE 06.06.2024	PAGE 52 of 56	

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.

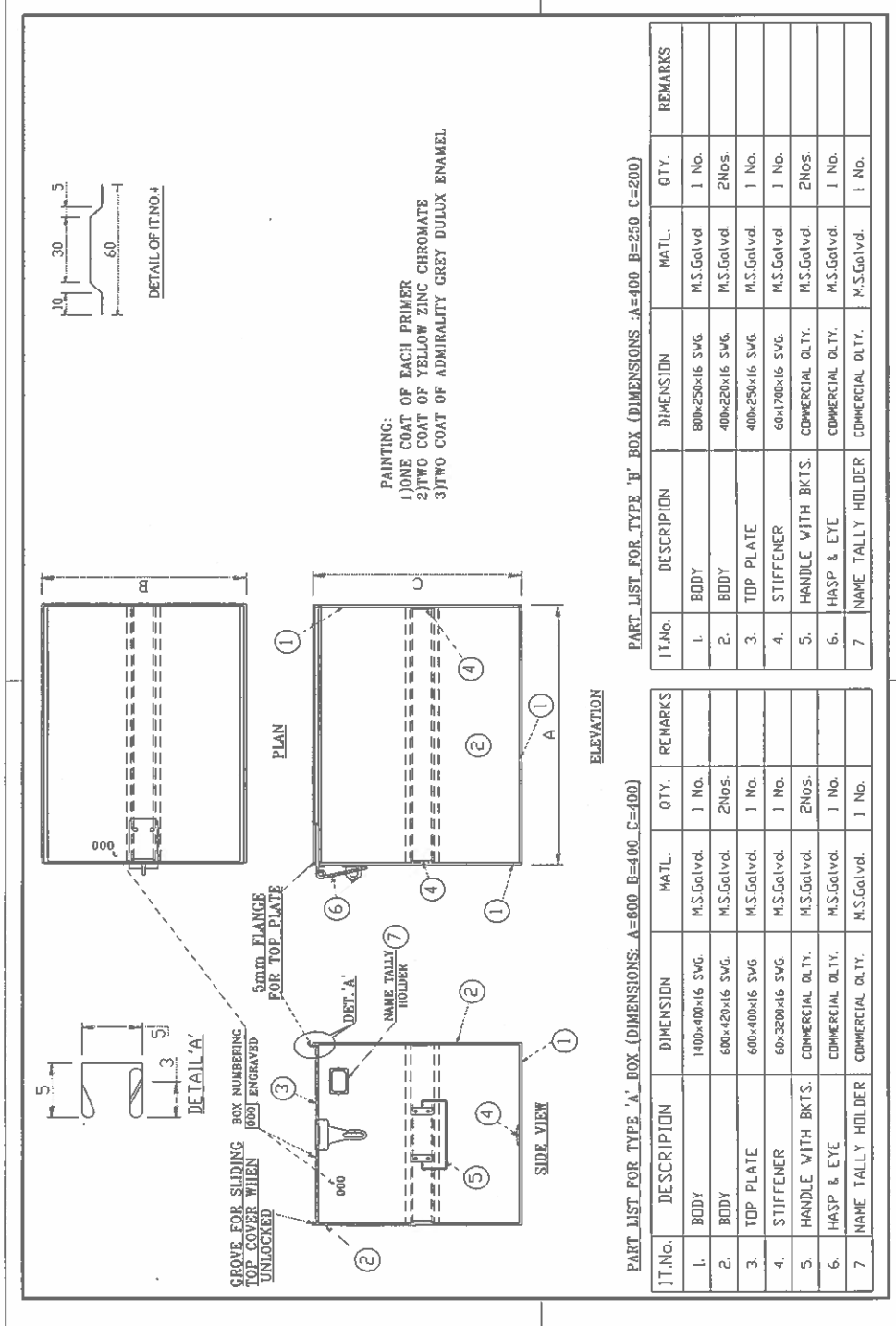


MAZAGON DOCK SHIPBUILDERS LTD.
(A Govt. Of India Undertaking)
Dockyard Road, Mumbai -400 010.

DESIGN ENGINEERING
YARD 16501 - 514
WATER JET SYSTEM

SOTR No. 3002
REV. NO. 01
DATE 06.06.2024
PAGE 53 of 56

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



PART LIST FOR TYPE 'A' BOX (DIMENSIONS: A=600, C=400)

IT.No.	DESCRIPTION	DIMENSION	MATL.	QTY.	REMARKS
1.	BODY	1400x400x16 SVG.	M.S.Galvld.	1 No.	
2.	BODY	600x420x16 SVG.	M.S.Galvld.	2Nos.	
3.	TOP PLATE	600x400x16 SVG.	M.S.Galvld.	1 No.	
4.	STIFFENER	60x3200x16 SVG.	M.S.Galvld.	1 No.	
5.	HANDLE WITH BKTS.	COMMERCIAL D.LTY.	M.S.Galvld.	2Nos.	
6.	HASP & EYE	COMMERCIAL D.LTY.	M.S.Galvld.	1 No.	
7.	NAME TALLY HOLDER	COMMERCIAL D.LTY.	M.S.Galvld.	1 No.	

PART LIST FOR TYPE 'B' BOX (DIMENSIONS: A=400, B=250, C=200)


IT.No.	DESCRIPTION	DIMENSION	MATL.	QTY.	REMARKS
1.	BODY	800x250x16 SVG.	M.S.Galvld.	1 No.	
2.	BODY	400x220x16 SVG.	M.S.Galvld.	2Nos.	
3.	TOP PLATE	400x250x16 SVG.	M.S.Galvld.	1 No.	
4.	STIFFENER	60x1700x16 SVG.	M.S.Galvld.	1 No.	
5.	HANDLE WITH BKTS.	COMMERCIAL D.LTY.	M.S.Galvld.	2Nos.	
6.	HASP & EYE	COMMERCIAL D.LTY.	M.S.Galvld.	1 No.	
7.	NAME TALLY HOLDER	COMMERCIAL D.LTY.	M.S.Galvld.	1 No.	



	MAZAGON DOCK SHIPBUILDERS LTD. (A Govt. Of India Undertaking) Dockyard Road, Mumbai –400 010.		DESIGN ENGINEERING		SOTR No. 3002
	YARD 16501 - 514		REV. NO. 01		DATE 06.06.2024
	WATER JET SYSTEM		DATE 06.06.2024		PAGE 54 of 56
	WATER JET SYSTEM		DATE 06.06.2024		PAGE 54 of 56

Annexure - 9
MAINTENANCE MANAGEMENT SOFTWARE (MMS) FORMAT

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

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	YARD 16501 - 514		REV. NO.	01
	WATER JET SYSTEM		DATE	06.06.2024
			PAGE	55 of 56

Annexure - 10
TIMELINES FOR TASKS AND DELIVERABLES (DURATIONS)

FOR MDL				
	Activity	Yard 16501 - 14		
		From	To	Duration (Weeks)
	Placement of order	P		
1	Binding Data	P	P+3	03
2	QAP	P	P+2	02
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	As per SOTR		
	(a) In Stores OR			
	(b) On- board			
8	Services of Engineers	As per SOTR		
	(a) Installation			
	(b) STW			
	(c) HATs			
	(d) SATs			
	(e) For Routines			
	(f) Training			
9	OBS for two years	As per SOTR		
10	Warranty			
11	B&D Spares	As per SOTR		

* - These end dates will be indicated as calendar dates in the Purchase Order.
 P- Placement of Purchase Order, E- Equipment Delivery, D- Planned Delivery
Above timelines are tentative, subject to change.



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YARD 16501 - 514

WATER JET SYSTEM

SOTR No. 3002

REV. NO. 01

DATE 06.06.2024

PAGE 56 of 56

**Annexure-11
CRITICAL DIMENSIONS FOR WATERJET**

