SPECIFICATION FOR ROTARY VANE TYPE MARINE ELECTRO HYDRAULIC STEERING GEAR SYSTEM FOR 6 NOS. QUAD PROPULSION CATAMARAN TYPE SURVEY VESSELS FOR INDIAN NAVY, YARD NOS. 257 TO 262

1.1

No.	Description of requirements and scope of supply	Qty. / Ship	To be declared / confirmed by Manufacturer / Supplier
1.	**TYPE AND CAPACITY** Marine electro hydraulic rotary vane type Torque: 2.5 t-m [approx.] x 2 **Note**: The torque value specified here is based on the preliminary calculations, however steering gear manufacturer to calculate and workout the same and detailed calculations based on vessels data and various operating conditions to be submitted to the yard. Final torque accepted / approved to be considered for the supply of steering gear system.	One set [2 nos.]	Qty.: ……. / ship …… Torque: …. KNm x 2 …….. …….. …….. …….. …….. ……..
2.	**POWER PACK** Redundant power packs each consist of hydraulic pump, squirrel cage type AC, electric motor, 415 V, 3 Phase, 3 Wire, 50 Hz, Class "F" Insulation, Enclosure IP-55, motor should confirm to EED-Q-071 [R2] standards and to have thermistor sensor fitted in winding. Hydraulic tank fitted with filters, oil level switches, Gauge glass, Inlet-outlet pipes, Drain valve, solenoid valves for directional control, Oil lock, Pressure relief valve, Pressure gauge, Valve block and push pins for manual operation in case of tele control failure etc. Each power pack to be capable of satisfying the classification rule requirement and operating requirements independently. One power pack shall be operated in normal service navigation and the other shall serve as a standby, however both shall be operated during maneuvering if required.	Two sets	Qty.: ……. / ship …….. …….. …….. …….. …….. …….. …….. …….. …….. …….. …….. …….. …….. ……..
3.	**ACTUATORS** Actuator rotary vane type fitted with integral base plate with premachined rudder stock hub and upper rudder bearing and shock valve, distributor block, necessary shut off and bypasses valves, fittings and hoses etc. Slid type rudder carrier of suitable size and with grease lubricated type synthetic bearing faces. Actuators to be suitable for fitment with high lift type rudder arrangement. System should be capable of putting the rudder over from about 70 degrees on hard port side to about 70 degrees on hard stbd side with the ship at its full loaded draft and running ahead at maximum speed and under the same conditions from 35 degrees on either side to 30 degrees on other side in not more than 28 seconds with one pump unit and not more than 14 seconds with two pump units. **EMERGENCY OPERATION** Time for putting rudder from 15 degree port to 15 degree stbd or vice versa with one pump unit in not more than 60 seconds. Facility is to be provided to mechanically and hydraulically lock the rudders. Emergency isolation of one rudder should be feasible.	One ship set	Qty.: ……. / ship ……..

No.	Description of requirements and scope of supply	Qty. / Ship	To be declared / confirmed by Manufacturer / Supplier
4.	**HAND HYDRAULIC HELM PUMP** For emergency steering operation mode, suitable hand hydraulic helm pump fitted with hyd. lock valve or other suitable means along with hoses, fittings and steering wheel to be provided for the operation of steering gear on steering stand when both the power packs for steering is out of function.	One set	Qty.: ……. / ship …….. …….. …….. …….. ……..
5.	**OTHER ITEMS REQUIRED** A] Rudder angle indication system of resistance type 1] Three face type indicator beneath wheelhouse front ceiling centre with a separate dimmer switch on bridge control console. 2] Flush mounting and watertight type indicator with an illumination light and a dimmer switch on both bridge wings. 3] Watertight type indicator for mounting in steering gear compartment of each hull form of catamaran. 4] For mounting in machinery control room B] Drip proof transmitter connected to the rudder stock/s for taking connections for all above mentioned rudder indicators along with required linkages and connections. C] Non follow up steering Joy-stick/helm control fitted on steering stand. D] 24 V.D.C. Power operated rudder limit switches. E] Remote control attachment for follow up and non follow up mode with flexible wire for operation from bridge wings. F] Mechanical rudder indicator/s (angle scale with pointer) G] Set comprising two nos. pre machined tiller for attachment to rudder shaft. Same shall be manufactured by steering gear manufacturer and supplied directly to high lift rudder manufacturer for final matching and fitting of tiller hub cone to rudder stock including blue print test and class approval of tiller stock connection.	 1 No. 2 Nos. 2 Nos. 1 No. One set One set One set One set One set One set	……..
6.	**AUTO PILOT** Auto pilot suitable for attachment with steering gear system with follow up and non follow up mode selection and having facility for interface from gyro compass and also the sensor for interface with VDR as per statutory requirements.	One set	Qty.: ……. / ship …… …… …… ……

No.	Description of requirements and scope of supply	Qty. / Ship	To be declared / confirmed by Manufacturer / Supplier
7.	**STEERING GEAR CONTROL PANEL** Steering gear control, alarm and monitoring panel for MCR and bridge fitted on steering stand top / console (flush mounting) comprising following; A] Control power and Starting switch for each Main and Auxiliary (Standby) steering HPU. B] Rudder control switch for Auto Pilot. C] Rudder control switch for follow up D] Signal lamp (Green) showing indication for each system running. E] Potentiometer for signaling lamps. F] Signal lamp (red) for low oil level [+VDR*] G] Signal lamp (red) for low oil pressure H] Signal lamp (red) for hydraulic locking I] Signal lamp (red) for power failure [+VDR*] J] Signal lamp (red) for control power failure [+VDR*] K] Signal lamp (red) for phase failure [+VDR*] L] Signal lamp (red) for overload [+VDR*] M] Alarm buzzer N] Push button for lamp test O] Hydraulic oil pressure gauge P] Hydraulic oil temperature gauge * VDR: Including dry contacts to above indicated alarms Additionally, the control panel to deliver following alarms to the ship's monitoring system; (I) Two group alarms [each one / HPU] (II) Two separate oil level alarms [each one / HPU] (III) One control panel failure alarm [self checking] **Notes**: (a) The signal lamps are also to have push buttons, pushing them while activation the alarm buzzer should go-off but the light continue to glow until the cause of the alarm has been eliminated. (b) Not limited to the specified above the arrangement to be provided as per manufacturer's standards and for the total compliance of the relevant class notation, Indian Navy standards and statutory requirements applicable for the subject vessel including signals / interface facility with VDR. (c) All the gauges to be self illuminated type with the provision of dimmet switch. (d) If one alarm is activated and acknowledged & in the meantime other fault occurs, corresponding alarm also should activate irrespective of previous alarm. (e) DME specification 405 (R2), 411,412,413 & 424 of Indian Navy are to be used as guidance specifications for selection, supply and installation of instrumentation/alarm/monitoring system. Deviations if any, are to be clearly stated by the vendor in their technical offer with adequate justification.	One Set	Qty.: ……. / ship …….. …….. A] …… B] …… C] …… D] …… E] …… F] …… G] …… H] …… I] …… J] …… K] …… L] …… M] …… N] …… O] …… P] …… …… …… …… (I) …… (II) …… (III) …….. (a) …… …… …… (b) …… …… …… …… …… (c) …… …… (d) …… …… (e) …… …… …… …… ……

No.	Description of requirements and scope of supply	Qty. / Ship	To be declared / confirmed by Manufacturer / Supplier
	(f) Control for propulsion and manoeuvring machinery / equipments will be microprocessor based auto control system, with distributed digital control system. Accordingly steering gear system is to be provided with suitable interface arrangements for proper integration as may be required. (g) MCR instrumentation / monitoring system to be replicated for bridge. (h) Required name / identification / talley plates in English language to be provided for all panels / components.		(f) …… …… …… …… …… (g) …… …… (h) …… ……
8.	**RELAY BOX** Relay box for control and alarm panel to be mounted inside the steering stand and to be connected with control and alarm panel by means of cables equipped with multipin plugs and sockets, type of enclosure for relay box is to be IP56.	One No.	Qty.: ……. / ship …….. …….. …….. ……..
9.	**STARTER PANEL** Bulkhead mounting type Starter panel having IP55 enclosure for operating and monitoring of the electric motor from steering gear compartment or any other suitable location for Power Packs comprising following: • Starter units confirming to EED-Q-071 [R2] standard for pump drives. Starters to have protections for under voltage, over current, short circuit, single phase etc. and connection for thermistors in motor • Control switch (3 position) marked as (1) Remote control (2) Off & (3) Start. • Selector switch for Main/Auxiliary (Standby) Power Pack operation. • Signal lamp (Green) showing running / [Red] stop • Circuit breaker • Thermal relay • Phase failure relay • Required fuses • Transformer for control current/voltage • Terminals for wiring • Dry contacts for VDR • Operating hour meter **Note**: 1) Starter panel to have facility for cable entries for Main supply cable, Power packs motor cables, Bridge / E.R. relay units cables, oil level sensor cable, Oil pressure sensor cable, Limit switch cables, Solenoid valve cables etc. Provision to be made to start the Power pack from steering stand in wheel house. However local starter panel fitted in steering gear compartment or at any other suitable place should be able to over ride the starting from wheelhouse. 2) Starter for motor of power pack to be provided with low voltage release protection to permit motor being restarted automatically on restoration of power	One No.	Qty.: ……. / ship …….. …….. …….. …….. • …….. …….. …….. • …….. • …….. • …….. • …….. • …….. • …….. • …….. • …….. • …….. • …….. 1) …….. …….. …….. …….. …….. …….. …….. …….. 2) …….. ……..

No.	Description of requirements and scope of supply	Qty. / Ship	To be declared / confirmed by Manufacturer / Supplier
	3) All electrical equipments and machinery to be capable of continuous operation when fitted at any direction up to an angle of 30^0 from vertical plane passing through the centre line of the equipment 4) Thermal over load relay with built in single phase protection contactors and overload relays as per approved list of IRS to be used		3) …….. …….. …….. 4) …….. ……..
10.	**ALARM PANEL FOR ENGINE CONTROL ROOM** Separate Alarm Panel comprising items specified at Sr. No. 7 "Steering gear control panel" to be provided. Panel to have IP-44 enclosure.	One No.	Qty.: ……. / ship …….. …….. ……..
11.	The vessel/s will be installed with the integrated propulsion control/bridge and platform management system. Accordingly steering gear system is required to be equipped with all necessary accessories / sensors required for interface and integration of above said system/s.	One Set	Qty.: ……. / ship …….. …….. ……..
12.	**EXPANSION RESERVOIR** Suitable expansion tank / spare oil tank of the capacity to charge power pack tank/s to be provided. Tank to be fitted with filling, drain, outlet connections, sight glass etc.	One No.	Qty.: ……. / ship …….. ……..
13.	Hydraulic oil cooler [if required] suitable for SW cooling with 70/30 Cupro Nickel tube material.	One No.	Qty.: ……. / ship ……..
14.	SW cooling pump [if applicable] of required capacity. Material of construction Nickel Aluminium Bronze / SS shaft. And electric motor driven as per class requirements and Indian Navy standard	One No.	Qty.: ……. / ship …….. ……..
15.	**DRAWINGS & MANUALS** • Installation, operation and maintenance manual (each for complete steering gear system) • Spare part catalogue • Dimensional Drawings for all the components and accessories • GA & detailed dimensional drawing for installation • Complete electrical system drawing • Autopilot manual • Hydraulic and cooling system drawing **Note**: Technical documents as listed above are to be provided inline with D-787 of Indian Navy	 6 Sets 6 Sets 6 Sets 6 Sets 6 Sets 6 Sets 6 Sets 6 Sets	 • …….. set / ship • …….. set / ship • …….. set / ship • …….. set / ship • …….. set / ship • …….. set / ship • …….. set / ship ……. …….
16.	Any components not specified here above but found necessary for efficient working of the system the same needs to be included in scope of supply.	To be declared and confirmed	……. ……. …….
17.	**SITE CONDITION** Steering gear system to perform satisfactorily under following site conditions Ambient air temp.: (-) 10° C to (+) 40° C Maximum temp. in engine room: (+) 55° C Sea water temp.: 1° C to 35° C Relative humidity/salinity: Up to 90% condensation at 35° C Salinity of water up to 35 PPM		……. ……. ……. ……. ……. ……. …….

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<tr><th>No.</th><th>Description of requirements and scope of supply</th><th>Qty. / Ship</th><th>To be declared / confirmed by Manufacturer / Supplier</th></tr>
<tr><td>18.</td><td><u>OPERATING CRITERIA AND OTHER REQUIREMENTS</u>

A) Steering gear and its associated system / components should be capable of efficient operation under the following conditions of vessel during operation.
a) Heel: 20^0 continuous either side
b) Roll: 20^0
c) Trim: 5^0 continuous
d) Pitch: 6^0

B) Machinery / equipment should have reliability and maintainability for a minimum mission period of four weeks.

C) The steering gear system offered should confirm and comply to the Indian Navy RFP requirements as applicable

D) <u>Sea Worthiness</u>: The vessel together with its machinery and equipments/system to be capable to transit on all the headings up to sea state 4 and capable of conducting hydrographic survey operation up to sea state 3. The vessel and its machinery and equipments also to be survivable at best heading up to sea state 5.</td><td></td><td>……

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<tr><td>19.</td><td><u>OPERATING MODE AND SPEED OF THE VESSEL</u>

Vessel’s propulsion and meanouvering machinery exploitation will be assumed as to ensure vessel operation of 4500 hours per year. Speed, range, endurance and mission duration is clearly specified as follows;

<table>
<tr><th>Speed range [knots] and operating mode</th><th>Installed engine power [MCR] required [kw]</th><th>% of annual hours [% of 4500 hours]</th><th>No. of propulsion drive in operation</th></tr>
<tr><td>0 to 6 knots, hydrographic survey operation</td><td>[1x895]</td><td>10% [450 hours]</td><td>One</td></tr>
<tr><td>12 knots, cruising / economical speed operation</td><td>[2x895]</td><td>80% [3600 hours]</td><td>Two</td></tr>
<tr><td>18 knots, sprint/full speed operation</td><td>[4x895] *</td><td>10% [450 hours]</td><td>Four</td></tr>
</table>

<u>Note</u>: Maximum speed [18 knots] shall be achieved at 85% MCR of the engines at maximum displacement of the vessel.</td><td></td><td></td></tr>
</table>

No.	Description of requirements and scope of supply	Qty. / Ship	To be declared / confirmed by Manufacturer / Supplier
20.	**INSPECTION AND APPROVAL / CERTIFICATION** Steering gear system is required to be design, tested and certified by IRS or LRS on behalf of IRS in accordance with their latest rules and regulations applicable for the vessel including its machinery and equipments with class notation of +100 A1 SSC SURVEY VESSEL G3 +LMC UMS CEPAC or equivalent. The machinery shall also comply with the applicable rules, regulations and requirements of the regulatory bodies without conditions / recommendation. The vessel will be built in accordance with IHQ-MOD (N) guidelines of Indian Navy. Steering gear also required to comply with IHQ-MOD (N) requirements and to be certified for the same. Noise levels should be as per IS-13161 [Part 3] standards. Steering gear also required to comply with NSS II shock standards by calculations as applicable. The steering gear should also meet international norms on personnel safety (IMO / MARPOL regulations) and SOLAS regulation on personnel safety as applicable. Original classification society approved drawings, classification society approval certificate and test reports for steering gear arrangement and components to be submitted to the yard.	To be confirmed	…… …… …… …… …… …… …… …… …… …… …… …… …… …… …… …… …… …… …… ……
21.	**TRAINING** The ship's crew, shore maintenance staff and staff of training school to be trained at the OEM's factory premises for each of the ship on the operation maintenance and of repair methodology of machinery / system installed onboard. Training aids comprising of cut section models, audio visual / CBT packages on operation, maintenance and repair activities are to be provided by vendor. The training schedule will be prepared in consultation with IHQ – MOD well in advance. Entire cost for the training to be borne by the vendor.		…… …… …… …… …… …… …… …… …… ……
22.	**DELIVERY SCHEDULE** Delivery of six ship sets are strictly required at shipyard as per following schedule 1st ship set June 2008 2nd ship set Sept 2008 3rd ship set Dec 2008 4th ship set Mar 2009 5th ship set June 2009 6th ship set Sept 2009		…… …… …… …… …… …… …… ……
23.	**COMMISSIONING** Installation and commissioning assistance by competent service engineer as per yard schedule at supplier's cost		…… ……
24.	**WARRANTY** 12 months from the date of delivery of the respective vessel to the Indian Navy		…… ……

No.	Description of requirements and scope of supply	Qty. / Ship	To be declared / confirmed by Manufacturer / Supplier
25.	**APPROVAL OF DRAWINGS AND SPECIFICATIONS** Within two weeks of placement of order the manufacturer is to forward to the yard, a drawing and technical information / calculation schedule indicating list of documents / drawings and proposed dates by which these will be submitted to the yard, class, statutory authority and IHQ-MOD(N) respectively for their approval. This list should contain the drawings / documents / information / calculations etc. required as per all above agencies / authorities. All the drawings and technical information are to be submitted by the manufacturer on magnetic media with required number of hard copies for onward submission to IHQ-MOD[N] for their approval and record. All the drawing / technical information that requires yard / class / statutory authority approval are to be first submitted by the manufacturer to all above for their approval and after obtaining their approvals same shall be submitted to IHQ-MOD(N) for their final scrutiny, comments and approval.		
26.	**EQUIPMENT DRAWINGS** Before manufacturing/supplying any equipment, fitting or material, the manufacturer is to forward final detailed drawing / specification for the prior approval of all concern. Approval of the yard, class and statutory authority as applicable shall be obtained by the manufacturer prior to submission to IHQ-MOD[N]. The approval of any proposal, specification, drawing will not exonerate the manufacturer from their responsibility in connection with the correct supply and functioning of the systems and complete installation		
27.	**AS MADE DRAWINGS AND DISTRIBUTION OF DOCUMENTS** The manufacturer to furnish a list of “As made” drawings of various equipment proposed to be supplied. Same shall be subject to approval of the yard and IHQ-MOD(N). All drawings and documents are required to be supplied on magnetic media also in addition to the hard copies. The electronic documents to be in compliance with IETM/CALS format. The documents such as Ship Fit Definition [SFD], D-787, list of B&D and onboard spares, OEM / Manufacturer / Vendor details etc. to be provided in Integrated Logistic Management System [ILMS] format. The manufacturer is to ensure that the tracings and prints are of the best quality and to the satisfaction of the yard and Naval Overseer. The requirements of sets of “As made” drawings, velographs, manuals and other documents are to be supplied by the contractor / vendor for distribution to various Naval authorities as per following list for “Distribution of Documents”.		

DISTRIBUTION OF DOCUMENTS

SL. NO	DESCRIPTION OF DOCUMENTS	SOURCE	TYPE OF DOCUMENT	IHQ-MOD(N)				ADMIN AUTH *				REPAIR AUTH *						MS *				WPS/WOT	SHIP	SMA	MTU/ETMU/WATT	DQA(WP)/DQA(N)	SHIVAJI/VALSUR	TOTAL
				PROD. DTE.	PROF. DTE.	DFM	DLS	HQ WNC	HQ ENC	HQ SNC	HQ ANC	ASD (M)	ASD (V)	NSRY(C)	NSRY(PB)	FMU(B)	BMU(V)	MS(B)	MS(V)	NSD(PB)	NSD(C)							
1	SCHEMATIC SYS. DRGS	S/B	VELO		1									1														2
			PRINT	1	1	1				1				2		1	1	1				1	1	1	1	1	1	15
2	AS MADE EQPT DRGS	S/B	VELO		1									1														2
			PRINT	1	1	1				1				2		1	1	1					1	1		1	1	13
3	CPL/PIL	S/B	PRINT	1	1		1			1				1		1	1	1					1					9
4	EQPT HAND BOOK	S/B	PRINT	1	1	1				1				1		1	1	1				1	1	1	1	1	1	14
5	INSTALLATION SPECS	S/B	PRINT	1	1	1				1				1								1	1					7
6	EQPT CODE	S/B	PRINT	1	1	1	1			1				1								1	1			1		9
7	MACHINERY INFO BOOK	S/B	PRINT	1	1					1				1		1	1					1	1	1			1	10
8	TEST CERTIFICATES LLYODS / IRS ETC	S/B	PRINT	1	1									1								1	1			1		6
9	EQPT ORDER COPY	S/B	PRINT	1	1																	1				1		4
10	OPERATION, MAINTENANCE MANUAL.	S/B	PRINT	1	1									1		1	1					1	1	1	1			9
11	MATERIAL SCHEDULE	S/B	PRINT	1	1									1								1	1					5
12	MAINTENANCE SCHEDULE	S/B	PRINT	1	1	1				1				1		1	1					1	1	1			1	11
13	D-787	S/B	VELO		1																							1
			PRINT	1	1	1	1			1				1				1				1	2					10
14	HATS/SATS SCHEDULE	S/B	PRINT	1	1																							2

No.	Description / Requirement	Quantity	To be Confirmed / Declared by Manufacturer
21	Yard / IHQ-MOD(N) reserve the right to depute their representatives to witness Factory Acceptance Test / Trials of equipment. The vendor is to intimate the dates of these trials at least six weeks in advance to the yard.		

1.2 **TECHNICAL AND OTHER INFORMATION**

Following drawing / data / information to be submitted along with your technical offer

No.	Requirement / Description	To be declared / confirmed / submitted by Manufacturer / Supplier
1	Dimensional GA drawing for the steering gear system	
2	Dimensional drawing with weight specified for each component and accessories of the system	
3	Installation drawing with foundation details for each equipment	
4	Hydraulic system circuit diagram and specification / grade of hydraulic oil required for system	
5	Complete electrical power and control system circuit diagram for each system i.e. AC 415/220 V, DC 24 V	
6	Alarm and control panel drawing	
7	Hydraulic power pack drawing and quantity required of hydraulic oil for complete system	
8	Helm pump and steering wheel drawing	
9	Starter panel drawing	
10	Expansion [hydraulic oil] tank drawing	
11	Potentiometer and rudder angle indicator drawing	
12	Details of rated power in kw and rated rpm of electric motor for hydraulic power pack / pump	
13	Details of operating pressure at maximum torque and pressure rating data for pressure relief valve	
14	Drawing/circuit diagram for system like hydraulic oil cooling including cooler and pump [S.W. cooling]	
15	Noise level data	
16	Heat dissipation data	
17	DME 452 is to be the guiding document for preparation and distribution of all technical / information	
18	Introduction of organization including details of turnover, sales figures and reference list	
19	Construction / performance details of equipment / machinery offered	
20	Product support strategy including minimum stock level, lead time for supply, rupee payment facility for imported items if any	
21	Details of service network	
22	Details of import content as applicable and indigenisation plans for the same	
23	Life cycle costing taking in to consideration, operating, watch keeping, maintenance, spares and other associated costs	
24	General content of standard documentation being provided [details of operation manual, technical manual, PIL, watch keeping, calendar based routines, stock calculations etc.]	
25	Letter of undertaking contractual commitment to provide product support for a minimum period of 15 years after delivery of the last vessel to Indian Navy or 20 years after delivery of the vessel whichever is later. In case the equipment / machinery is likely to become obsolete, the vendor should confirm to give a clear three years notice to the Indian Navy to assess the requirement of “life time buy” of the spares. The vendor should also confirm and ensure supply of these items prior to discontinuation of the production facilities	

1.3 **ONBOARD SPARES AS A STANDARD SCOPE OF SUPPLY FOR STEERING GEAR SYSTEM FOR 2 YEARS (OPERATION CYCLE: 4500 HOURS / ANNUM) OPERATION OF THE SHIP AS PER CLASS REQUIREMENT AND MAKER'S STANDARD (LIST OF ABOVE SPARES TO BE SUBMITTED WITH QTY. SPECIFIED)**

No.	Description	Quantity / Ship	Remark
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1.4 **TOOLS, SPECIAL TOOLS INCLUDING HYD. TOOLS/HIGH PRESSURE PUMPS, JIGS AND FIXTURES REQUIRED FOR THE INSTALLATION / OPENING AND GUARANTEED OPERATION CYCLE OF TWO YEARS AS A STANDARD SCOPE FOR STEERING GEAR SYSTEM AS PER CLASS REQUIREMENT AND MAKER'S STANDARD (LIST OF ABOVE TOOLS TO BE SUBMITTED WITH QTY. SPECIFIED)**

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1.5 **BASE AND DEPOT SPARES FOR STEERING GEAR SYSTEM FOR 5 YEARS OPERATION OF THE SHIP AS PER MAKER'S STANDARD (LIST OF ABOVE SPARES TO BE SUBMITTED WITH QTY. AND ITEM RATE / PRICE SPECIFIED)**

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