माझगांव डॉक शिपबिल्डर्स लिमिटेड

MAZAGON DOCK SHIPBUILDERS LIMITED

Mumbai-10

रुचि की अभिव्यक्ति (ईओआई) का आमंत्रण

NOTICE INVITING EXPRESSION OF INTEREST (EOI)

FROM REPUTED VENDORS FOR

HIRING OF SERVICES FOR PIPING AND ENGINEERING WORK FOR PROJECT-MRLC 2

1. EOI Ref. No. : EY/CD/SP/MRLC-2/2022
2. Description : Hiring of services for Piping and Engineering work for Project-MRLC 2
3. Date of Issue of EOI : 11.06.2022
4. Last date for Submission of EOI : 21.06.2022

CERTIFIED ISO 9001: 2008 for Submarine Division	माझगांव डॉक शिपबिल्डर्स लिमिटेड MAZAGON DOCK SHIPBUILDERS LIMITED (A govt. of India Undertaking) Dockyard Road, Mumbai 400 010.INDIA PHONE +91(22) 2376 2615 FAX No. - 91(22) 23741386 Website - www.mazdock.com

रुचि की अभिव्यक्ति (ईओआई) का आमंत्रण

"EXPRESSION OF INTEREST" (EOI)

EOI No: -EY/CD/SP/MRLC-2/2022 for Hiring of services for piping and engineering work for Project MRLC	
EOI date : 11.06.2022	
CLOSING DATE : 21.06.2022	**OPENING DATE : 21.06.2022**

SUB: INVITATION OF "EXPRESSION OF INTEREST" (EOI) from Reputed Vendors with expertise in the field of Hiring of services for Piping and Engineering work for Project-MRLC

Mazagon Dock Shipbuilders Limited is the India's premier shipyard under the Ministry of Defence Production constructing warships, Submarines. The company invites Expression of Interest from reputed ISO certified indigenous firm's engaged in shipbuilding activities/ marine structures for long term participation in its production programme for piping and engineering work for Project-MRLC 2.

SUB: Hiring of services for piping and engineering work for Project-MRLC

MAZAGON DOCK SHIPBUILDERS LIMITED INVITES expression of interest (EOI) IN TRIPLICATE from reputed ISO certified Indigenous Contractors/ship builders with expertise in the field of ship building/marine structures for the following Work.

1. **Brief Scope of work:**

MDL intends to outsource Refit work of SSK Class Submarine work of Naval Submarine (INS Shankush MRLC 2) for Engineering and Piping works on turnkey basis to be carried out inside MDL premises. MDL is floating EOI to explore suitable competent vendors to undertake the above job meeting the required quality and timelines

A. The broad scope of work for the EOI is as follows:

a) Degutting
b) Storage with proper identification and record keeping
c) Overhauling & Pressure test
d) Arrangement of Spares for Overhauling of valves
e) Arrangement of Pipe fittings
f) Installation onboard including hardware
g) Pressure testing & Flushing of Piping systems
h) Setting to Work (STW)

Above refit work in following listed jobs of INS Shankush:

a) Piping including pipe fabrication & installation on submarines.

b) Overhauling of Hydraulic & Non- hydraulic valves and Installation
c) Overhauling of Engineering Equipment and Installation
d) Exhaust Gas Trunks Fabrication and Installation
e) Overhauling of Air conditioning and Refrigeration system and installation
f) Weapon and Mechanical work
g) Shafting & Steering Gear System
h) Overhauling of Hull equipment and installation

B. Three separate vendors to work in zone wise as detailed below:

a) Zone 1: Section 10 & 20
b) Zone 2: Section 31 & 32
c) Zone 3: Section 41, 42 & 50

C. Indicative work content is given in the following annexures

a) SOW of Piping works and Engineering works - Annexure A
b) Zone wise Engineering Equipment list- Annexure B
c) SOW for Cleaning and thickness gauging of Pipes – Annexure C
d) SOW for Piping Systems insulation and Deck Covering insulation -Annexure D
e) Quantum for Piping and Engineering work –Annexure E
f) Weapon and Mechanical work – Annexure -F
g) Shafting & Steering Gear System- Annexure G
h) SOW for Hull Equipment installation- Annexure H

2. Qualification Criteria:

A: For Piping & Engineering: -

Bidders should have experience of PIPING & ENGINNERING WORK on Submarines in the past 15 years (Documentary evidence like order copies & work completion certificates to be furnished) in following areas:

a. Piping including pipe fabrication & installation on submarines.
b. Overhauling of Hydraulic & Non- hydraulic valves and Installation
c. Overhauling of Engineering Equipment and Installation

Note: - Bidders need to have mandatory technical experience of Piping (Sl No.1) along with any one of the other two jobs (SL. No. 2 or 3) or MOU with experienced firm with documentary evidences. However, the secondary (tie up) firm should not participate in the tender directly. Even if the secondary firm participates in the tender, the bids will not be considered.

B. For Shafting & Steering Gear System: -

Bidders should have mandatory experience of SHAFTING AND STEERING GEAR installation on Submarines in the past 15 years (Documentary evidence like order copies & work completion certificates to be furnished)

ABOVE TWO PARTS A & B WILL BE TENDERED SEPARATELY. EOI BIDS FOR A AND B WORKS MENTIONED ABOVE WILL BE SCRUTINIZED SEPARATELY.

3. Financial Qualification Criteria:

Bidders must submit the following documents along with their offer:

i) Details of company Profile and valid Shop & Establishment registration certificate.

ii) Audited / Certified Balance sheet, Profit / Loss account for past 3 years and valid solvency certificate / Banker's opinion issued by Nationalized / Reputed international / scheduled bank.

iii) Bidder's average Audited Annual financial turnover certificate.

iv) Valid ISO certificate.

v) The bidders experience and past performance on similar services (Ship building & Marine Structures/piping) in the last 15 years (Order copies & work completion certificates to be appended).

vi) List of employees on their pay roll & their work experience/qualification related to SOW.

4. Terms & Conditions Of EOI: Participating firms shall indicate acceptance of terms & conditions of EOI as given below:

4.1 Confidentiality: All the information provided to the vendors shall be treated as confidential and should not be disclosed in any manner to any unauthorized person under any circumstances.

4.2 Statutory Requirement, Official Secret Act, Safety and Security Rules

In the event of placement of Order, contractor shall also abide to all statutory requirements, Official Secrets Act 1923, Security and Safety Rules. The documents are available on MDL website. ~~Bidders are required to submit a non-disclosure agreement on Rs.500 stamp paper in the format as per Enclosure-I~~

4.3 Submission of EOI:

EOI complete in all respect with all supporting documents in a Envelope securely closed (Sealed) super scribed with EOI No, due date, Time and firm's name addressed to:-

HOD,
Commercial Department–East Yard,
Mazagon Dock Shipbuilder Limited
Mumbai-10

EOI should be deposited on or before the EOI closing date and time.
TENDER BOX for East yard, Commercial, situated at MDL Reception Centre
MAZAGON DOCK SHIPBUILDERS LIMITED, Dockyard Road, Mumbai-10
Also MDL reserves right to demand/ask for soft copy through non Rewritable CD.

4.5 Bid rejection Criteria

i. Bids received after due date.
ii. Bidder's failure to furnish sufficient or complete details for evaluation of the bids within the given period.
iii. Incomplete / misleading / false / ambiguous in the proof of eligibility requirements.
iv. Failed to produce timely clarifications related thereto, when sought.
v. Bids not meeting qualification criteria
vi. Submitted more than one proposal for single specialization area.
vii. Declared ineligible by the Government of India / State govt. / Public sector undertaking.
viii. Information relating to the evaluation, clarification and recommendation for pre-qualification shall not be disclosed to bidders or any other persons not officially concerned with such process until the pre-qualification process is completed. Any effort by the bidder to influence MDL prequalification process may result in rejection of his EOI.

ix. Bidders who are debarred under PPP MII order 2017, GeM, CPPP including Tender holiday issued by MDL

x. Non-submission of Compliance Certificate w.r.t Land Border Clause as per the enclosed format. (Restrictions under Rule 144 (xi) of the General Financial

4.6 Opening Of EOI:

The EOI received will be opened on the due date at the declared time or next working day if closing date happens to be holiday declared by MDL. Participated firms, who wish to remain present during the EOI opening, should nominate on their company's letterhead the name and designation of one person authorized to remain present at the time of opening the EOI and send this letter so as to reach the undersigned at least one working day prior to closing date of the tender.

5. Purpose:

For identifying the firms who are interested to execute the work as per the standards and process as desirable for the scope of work.

All the EOI received by MDL, on or before the due date & time would be scrutinized w.r.t the scope of work. Upon completion of meetings and scrutiny, MDL will finalize tender. The firms may please note that mere meeting of the requirement mentioned in the EOI does not entitle any firm the right for awarding the tender or contract.

6. Expression of Interest & Selection of Bidders:

Technical offers submitted against expression of interest shall be evaluated by MDL user in line with present requirements as stated in the technical documents/EOI. MDL team may further visit to bidder's premises to ascertain the capability and capacity required to undertake the task. MDL team thereafter shall shortlist the suitable bidders based on the technical offers and visit report of MDL team to progress further. Decision of MDL team/User with regards to short listing of bidders shall be final. MDL has right to accept and reject expression of interest at any stage of the process.

7. Contact Person:

(i) For any further technical details/queries, firms may contact Mr D C Sonawane CM(PLG-EY),Tel no. 022-2376-3599 & mail- dcsonawane@mazdock.com, ckmahato@mazdock.com

(ii) For any commercial details/queries, firm may contact Shikha Pardhi, DM (C-EY), Tel No. +91 22 23782615 or Mr. Pravin Nikhare, CM(C-EY), Tel No. +91 22 23762614, Fax no. +91 22 23741386, pknikhare@mazdock.com

8. Public Grievance Cell:

A Public Grievance Cell headed by Shri. R R Kumar, General Manager has been set up in the Company. Members of public having complaints or grievances are advised to contact him on Wednesday between 10.00 hours and 12.30 hours in his office on Third Floor, D-1 Building, East Yard , or send their complaints / grievances to him in writing for redressal. Contact Telephone No is 23782338. Interested firms are requested to submit their Expression of Interest (EOI) on or before the due date & time.

Thanking you,
For MAZAGON DOCK
SHIPBUILDERSLIMITED,

Enclosure:-

a) **Official Secrets Act 1923 (Available on MDL Website)**

Note: The documents mentioned under reference and formats shall be downloaded from MDL's Website: www.mazdock.com > Tender/EOI

The technical Scope of work for EOI Piping & Engineering Refit Work :

1. MDL intends to outsource Refit work of SSK Class Submarine work of Naval Submarine (INS Shankush) MRLC-2 for Engineering and Piping works on turnkey basis. All jobs are to be carried out inside MDL premises. The complete submarine job will be offloaded to three firms to work parallelly with approximate 30 to 35 % to each firm to work in 3 separate zones on the submarine. However, there will be only ONE contractor for Pressure Testing and Flushing of the entire system on-board submarine for each Water, Air and Oil medium. All material of spares and hardware required for overhauling and installation of equipment / valves/ pipes including Pipe raw material is to be arranged by contractor. Any valve and equipment declared to be renewed, will be supplied by MDL.
2. MDL is floating EOI to explore suitable competent vendors to undertake the above job on turnkey basis meeting the required quality and timelines.
3. The broad scope of work for the EOI is as follows:
    1. Degutting
    2. Storage with proper identification and record keeping
    3. Overhauling & Pressure test
    4. Arrangement of Spares for Overhauling of valves
    5. Arrangement of Pipe fittings
    6. Installation onboard including hardware
    7. Pressure testing & Flushing of Piping systems
    8. Setting to Work (STW)

    Above refit work in following listed jobs of INS Shankush:
    - i) Piping including pipe fabrication & installation on submarines.
    - j) Overhauling of Hydraulic & Non- hydraulic valves and Installation
    - k) Overhauling of Engineering Equipment and Installation
    - l) Exhaust Gas Trunks Fabrication and Installation
    - m) Overhauling of Air conditioning and Refrigeration system and installation
    - n) Weapon and Mechanical work
    - o) Shafting & Steering Gear System
    - p) Overhauling of Hull equipment and installation

4. Three separate vendors to work in zone wise as detailed below:

- d) Zone 1: Section 10 & 20
- e) Zone 2: Section 31 & 32
- f) Zone 3: Section 41, 42 & 50

5. Indicative work content is given in the following annexures

    1) SOW of Piping works and Engineering works - **Annexure A**

    2) Zone wise Engineering Equipment list- **Annexure B**

    3) SOW for Cleaning and thickness gauging of Pipes – **Annexure C**

    4) SOW for Piping Systems insulation and Deck Covering insulation –**AnnexureD**

    5) Quantum for Piping and Engineering work **–Annexure E**

    6) Weapon and Mechanical work – **Annexure -F**

    7) Shafting & Steering Gear System- **Annexure G**

    8) SOW for Hull Equipment installation- **Annexure H**

6. <u>Prequalification Criteria</u>

<u>A: For Piping & Engineering: -</u>

Bidders should have experience of PIPING & ENGINNERING WORK on Submarines in the past 15 years (Documentary evidence like order copies & work completion certificates to be furnished) in following areas:

1. Piping including pipe fabrication & installation on submarines.
2. Overhauling of Hydraulic & Non- hydraulic valves and Installation
3. Overhauling of Engineering Equipment and Installation

Note: - Bidders need to have mandatory technical experience of Piping (Sl No.1) along with any one of the other two jobs (SL. No. 2 or 3) or MOU with experienced firm with documentary evidences. However, the secondary (tie up) firm should not participate in the tender directly. Even if the secondary firm participates in the tender, the bids will not be considered.

<u>B. For Shafting & Steering Gear System: -</u>

Bidders should have mandatory experience of SHAFTING AND STEERING GEAR installation on Submarines in the past 15 years (Documentary evidence like order copies & work completion certificates to be furnished)

ABOVE TWO PARTS A & B WILL BE TENDERED SEPARATELY. **EOI BIDS FOR A AND B WORKS MENTIONED ABOVE WILL BE SCRUTINIZED SEPARATELY.**

7. Right to accept or reject any or all offers:

    a) Notwithstanding anything contained in this EoI, MDL reserves the right to accept or reject any application and to annul the EoI process and reject all applications, of this EoI any time without any liability or any obligation for such acceptance, rejection or annulment and without assigning

    any reasons, thereof. In the event that MDL rejects or annuls all the applications, it may at its discretion, invite all eligible participating firms to submit fresh applications.

b) MDL reserves the right to disqualify any applicant during or after completion of EoI process, if it is found there was a material misrepresentation by any such applicant or the applicant fails to provide within the specified time, supplemental information sought by MDL.

c) MDL reserves the right to verify all statements, information and documents submitted by the applicant in response to the EoI. Any such verification or lack of such verification by MDL shall not relieve the applicant of his obligations or liabilities hereunder nor will it affect any rights of MDL.

Annexure-A

SOW for Piping works and Engineering works:

SR	Activity	Scope	Line Item	Description	Responsibility
I	**Documents Support** (Soft Copy)	Piping and Engg System	1	System Schematic	MDL
			2	Pipe Sketches	MDL
			3	Technical Manual (TM)	MDL
			4	Pipe Part List	MDL
			5	Section Wise - Routing Diagram	MDL
			6	Applicable Standards	MDL
			7	Installation Drawings of Equipment along with Part-list	MDL
			8	Modifications in documents/drawings arising due to onboard alteration/modification at any stage of Refit must be incorporated.	MDL
			9	All the documents (on Non-disclosure agreement given by Contractor), Drawings. Given by MDL are to be preserved by the Contractor for reference & is to be returned after the completion of the Project. Document in soft format will be provided.	Bidder
II	**Preparatory Activity** (Before Degutting)	Piping System	1	The Contractor is to study schematic drawing, Pipe Sketches, Technical Manual, Pipe Part List, Section Wise - Routing Diagram.	Bidder
			2	Identification of Pipes, fittings, clamps, valves, devices & Its Routing as per Schematic Drawing/Part Drawings/Technical Manual/Layout Drawings/Pipe Sketches (Isometric Drawings) before removal from boat.	Bidder
			3	Identify the pipe, adaptors, Tee-joints, valves and other fittings in the systems and put proper tallies around them indicating the pipe number/ fitting number.	Bidder
			4	Installing Hard Punch Metal tallies bearing RFID numbers / Bar code and Hard punched data on Degutted Pipes & Inline fittings, clamps, valves, devices before removal from boat.	Bidder
			5	Tallies should be of G.I. & tied with SS wire. G.I. tally & SS wire are to be arranged by the Contractor.	Bidder
			6	Format of data to be Punched on tallies will be provided by MDL.	MDL
			7	RFID numbers / Bar code and its scanners is in contractor scope, Soft copy file to be maintained by contractor and same to be shared to MDL.	Bidder
			8	Carrying out Degutting Inspection in presence of MDL QA & SRMT	Bidder
			9	Build Database of Degutted Pipes, Fittings , Supports(Metal Clamps, Wooden Clamps, UCMC Clamps, Seating's & Foundation) & Inline Valves &	Bidder

				Devices after Inspection	
			10	Prepare a list of items, in triplicate prior to removal from the Submarine and handover to Engineering. Dept. for crosschecking the identification of the items. After obtaining the clearance, the items have to be removed from onboard Submarine.	Bidder
			11	Report Deficiency List in hard and soft format (Excel) to MDL for Further Action.	Bidder
III	A. **Degutting** of Pipes, Pipe Supports , Inline Valves & Devices	Piping System	Contractor has to complete degutting activity of Pipes, Pipe Supports, Inline Valves & Devices within **3 Months** of placement of orders.		
			1	Before removing the pipes from Internal tanks contractor to ensure that all Internal Tanks are Degassed & Emptied by Hull Department, MDL	Bidder
			2	Build Database of Degutted Pipes along with its end fittings, inline fittings, Supports (Metal Clamps, Wooden Clamps, UCMC Clamps, Seating's & Foundation) & Inline Valves, Devices & equipment after Inspection. Excel file to be maintained and shared to MDL.	Bidder
			3	Carry out Degutting Inspection (to be witnessed by MDL). Inspection involves mustering of pipes, Inline fittings, clamps, valves, devices as per relevant drawings (Schematic Drawing/Part Drawings/Technical Manual/Layout Drawings/Pipe Sketches/Isometric Drawings)	Bidder
			4	No pipes, fittings should come out of the Submarine without the number tally on it & not signed by Ship Staff, for record.	Bidder
			5	Before removal of the connected pipes with the engine or equipment, permission shall be taken by the contractor from the on-board officer.	Bidder
			6	Obtain signature from the ***RMT (Refit Monitoring Team)/ IN*** on the list of items before shipping out the items of the Submarine and hand over a copy of the list to the OIC - Engg. for record.	Bidder
			7	An inventory (Data) is to be prepared by the Contractor about missing and damaged items on each equipment before removing from submarine. This is to be done in consultation with MDL and Ship's Staff.	Bidder
			8	Degutted Pipes, pipe end fittings, clamps, Supports, Inline fittings, valves, devices, hardware, foundations, Ebonite, Tafel plate, Adaptors, Tee-pieces, insulating bushes, fasteners, druck rings etc. are to be segregated and preserved (Section, System, Dia, DN & Material Wise) & Stored at Allocated Locations in Lock and key Arrangement (Custodian - Bidder). Pickling or galvanising of these item if any is in contractor's scope and preserve them on receipt.	Bidder

				Loss of any items will be the responsibility of Contractor and he has to compensate the same.	
			9	All open-ended fittings/ equipment should always be kept plugged or capped to prevent dirt entering the fittings/ equipment.	Bidder
			10	The Contractor is to ensure not to damage any fitting/pipe during removing, reinstallation and pressure testing. In the event of damage to any fittings/pipes, the cost of the same will be recoverable from the Contractor.	Bidder
	B. **Degutting** of Equipment (As per Annexure)	Engg System	Contractor has to complete degutting activity of Equipment within 3 Months of placement of orders.		
			1	Refer **Annexure-B** for List of equipment zone wise	MDL
			2	The Contractor is to study schematic drawing, Installation drg. Of equipment, Technical Manual, Pipe Part List, Section Wise - Routing Diagram as per the **zone** mentioned	Bidder
			3	Identification of Pipes, fittings, clamps, valves, devices & Its Routing as per Schematic Drawing/Part Drawings/Technical Manual/Layout Drawings/Pipe Sketches (Isometric Drawings) before removal from boat.	Bidder
			4	Installing Hard Punch Metal tallies bearing RFID numbers / Bar code and Hard punched data on Degutted Pipes & Inline fittings, clamps, valves, devices before removal from boat.	Bidder
			5	Storage of degutted items, opening inspection to be carried out at allocated space within MDL premises. These items will be under custody of subcontractor with lock and key arrangement. Degutted & overhauled components to be preserved and wrapped using protective film.	Bidder
			6	Lifting shifting for degutting, overhaul & installation activity to be carried out by trained rigging personnel using load tested lifting gears. Transportation within MDL premises by means of forklift, trailers, Truck, hand trolley , Hydra Crane, pallets etc. will be in subcontractors scope.	Bidder
			7	Overhead crane will be provided by MDL.	MDL
			8	Carry out Inspection prior degutting for mustering of components as per Installation Drawing/Part List/Technical Manual. Carry out weighing inspection of degutted equipment and its components. Subcontractor should have calibrated weighing scale and dynamometer	Bidder
			9	Removal & Disassembly to individual components. Clean to bare metal individual components & Carrying out Opening inspection. Report Deficiency list to MDL for further action.	Bidder
			10	Not a single Equipment including its seating and its associated items should come out of the Submarine without tally on it & not signed by Ship Staff, for record.	Bidder

			11	Obtain signature from the ***RMT (Refit Monitoring Team)/ IN*** on the list of items before shipping out of the Submarine and hand over a copy of the list to the OIC - Engg. for record.	Bidder
			12	An inventory is to be prepared by the Contractor (in soft excel format and hard copy format) about missing and damaged items on each equipment before removing from submarine. This is to be done in consultation with MDL and Ship's Staff.	Bidder
			13	All equipment/valves open-ends should always be kept plugged or capped to prevent dirt entering the fittings/valves/equipment.	Bidder
			14	The Contractor is to ensure not to damage any equipment, Seating or its associated items during removing, reinstallation and pressure testing. In the event of damage to any equipment, Seating or its associated items, the cost of the same will be recoverable from the Contractor.	Bidder
			15	Removal of Equipment Resting Foundations & Supports. Handing over to Hull Dept. for Survey, Rectification, Blasting & Paintings. Take Custody of Foundation of Equipment till Installation.	Bidder
			16	Removal of Equipment including Securing Arrangements, Fasteners, Shock Mounts Supports, Shims, Taffel plates, Locking Plates, Intermediate foundations etc. Preservation & Custody in separate racks till Installation of Equipment. Build Database in Excel file, same to be maintained and shared to MDL. The physical inventory as per database will be subjected to monthly Audit by MDL representative.	Bidder
			17	Preservation , Wrapping & Storage of Individual components at allocated Locations in Lock and key Arrangement (Custodian - Bidder)	Bidder
			18	For OEM Overhauled & Renewed Items, only removal and installation will be in Sub Contractors Scope. Relevant Inspections to be carried out	Bidder
IV	Degreasing, Chemical Cleaning, Paint Removal of Pipes	Piping System	Bidder has to carry out Degreasing, Chemical Cleaning, Paint Removal & old Insulation of Pipes. Bidder has to arrange equipment & material for this activity within MDL Premises (Except Mandatory Renewal Pipes as per DL)		Bidder
V	Gauging & Physical Inspection of Pipes	Piping System	Carry out Thickness Gauging of Pipes and Survey of Welded End Fittings after Cleaning (Pipes Other than Mandatory renewal pipes as per DL)		Bidder
VI	Pipe Fabrication	Piping System			

	1) Rejected after thickness Gauging 2) Mandatory Renewal Pipes as per DL. 3) Mandatory system Upgradation 4) Due to obsolete fittings		1	Bending & Fabrication of Pipes Rejected after thickness Gauging & Physical Inspection. Pipes are to manufactured using old pipe as template.	Bidder
			2	Mandatory Renewal Pipes as per Defect List. Pipes are to manufactured using old pipe as template. a) Carbon Steel pipe - 100% renewal. b) Cu-Ni/Cu - 100% renewal for pipes less than 25mm dia. c) Cu- Ni/Cu - Other sizes 50% renewal for each size. d) SS - 25% renewal for each size, except HPA system where 50% renewal for each size is to be catered. All associated fittings to be renewed.	Bidder
			3	Bending of the pipes is in subcontractor's scope of work and no tooling and dies for bending will be provided. Subcontractors shall manage the total bending activity independently. Subcontractors shall provide the status and details of bending activity to MDL from time to time. The pipe and material transfer/transport from MDL to Vendors and Vendor to MDL is in subcontractor's scope of work. Transport is an integral part of the bending activity.	Bidder
			4	Fabrication arising due to Mandatory System Upgradation using Wire Set as template. (Wire Set Material within Sub Contractor Scope)	Bidder
			5	Fabrication of pipes due to obsolete Fittings (Druckrings, Quick Release Coupling etc.)	Bidder
			6	Tubes (Pipes) for Fabrication of pipes are in sub-contractor's scope. Before fabrication of pipes, Material Certificates to be provided for clearance to MDL-QA. Welding & Brazing Consumables for Activity 1,2,3,4,5 including gases Viz-Argon Gas, MDL approved filler wire, Electrodes will be in subcontractors scope**.**	Bidder
			7	Welding & Brazing of pipes as per specification (WPS / BPS). Fabrication of pipes	Bidder
			8	Non Destructive testing such as visual, DP, Radiography as per QAP For welded and brazed pipes, Inspection as per the protocol should be offered to Q.A. (EY)/RMT/IN and get it cleared. Non Destructive testing , dark room & pit room facility will be provided by MDL.	Bidder
			9	Qualification of Brazing & Welding Personnel by MDL QA	Bidder

			10	Sufficient Equipment's like Bending Machine, Welding Machine, Brazing Set, Pipe Cutting machine, drilling machine.	Bidder
			11	Stage (PART) and Final(FULL) bending Inspection as per the protocol should be shown to Q.A. (EY)/RMT/IN for their acceptance and approval.	Bidder
VII	Shop Pressure Test of Pipes	Piping System			
			1	Shop Pressure Test of All Pipes **(old and new pipes)** as per Technical Manual, using the test media specified for the individual system & as per the Protocol and shown to Q.A. (EY)/RMT/IN for their acceptance and approval.	Bidder
			2	Pressure Test Medium will be in Subcontractors Scope (Oil, Compressed Air, Nitrogen)	Bidder
			3	Testing Adapters, Blank & Fittings (Ermeto Etc.),Flanges, end fittings, gasket, "O" rings, valve, pressure gauges etc. in subcontractors scope.	Bidder
			4	Testing Equipment like HP Air Compressors (350 Bar), LP Air Compressor , Cascade Cylinders, Hydraulic (water) Testing Pumps, Air Operated Testing Pumps, Centrifugal Pumps, Vacuum Pumps, Testing Manifolds, Hydraulic Power Packs will be in Sub Contractor Scope.	Bidder
			5	All pressure gauges, measuring equipment etc. using for pressure testing are required to be calibrated with certification.	Bidder
			6	End Caps fitment after pressure test. End caps to be arranged by Sub Contractor	Bidder
VIII	A. Overhauling of valves and Devices	Piping System			
			1	Carry out Opening Inspection of Valves and devices along with operating Handles, Levers, Combination Handles, Wrenches, Knobs, hand wheels, Gearing, Locking Mechanism etc. shown to Q.A. (EY)/RMT/IN for their acceptance and approval.	Bidder
			2	Prepare list of Renewal & overhaul spares as per opening inspection report.	Bidder
			3	Inspection of Renewed of Spares (All Material required of overhauling are in Sub-Contractor Scope) and Overhaul prior boxing up. Material Test Certificate to be provided for supplied spares. Shown to Q.A. (EY)/RMT/IN for their acceptance and approval.	Bidder
			4	Machining Activity, Lapping , Drilling, Tapping, Dechroming & hard Chrome plating, Galvanizing etc. if required to be done by Sub Contractor	Bidder
			5	Shop Pressure Test of Overhauled valves. Shown to Q.A. (EY)/RMT/IN for their acceptance and approval.	Bidder

			6	Setting to Work & Calibration of Safety Valves, Relief valves to be demonstrated to MDL QA & SRMT. Shown to Q.A. (EY)/RMT/IN for their acceptance and approval.	Bidder
			7	Wrapping of Overhauled valves with Cling film & Placing End Caps to Open Ends. Vacuum Packing to be done in case of Hydraulic oil Fittings & Equipment (Material in Subcontractors Scope)	Bidder
			8	Overhauled as well as BER Valves & Devices to be handed over to MDL	Bidder
			9	Storage of degutted items, opening inspection, Overhauling, assembly to be carried out at allocated space within MDL premises. These items will be under custody of subcontractor with lock and key arrangement.	Bidder
			10	For Equipment which are to overhauled outside MDL premises shipment to be carried out through wooden boxes and proper packing.	Bidder
			11	Missing operating Handles, Levers, Combination Handles, Wrenches, Knobs, hand wheels (as per the mustering at Degutting stage) are in the scope of contractor	Bidder
	B. Overhaul of Equipment	Engg System	1	Removal, Overhaul & Reinstallation of All components of Shafting from Propeller Cone to Main Motor, Renewal if parts if required	Bidder
			2	Removal, Overhaul & Reinstallation of All components of Steering gear like Drives, Linkages, Deva Bushes & Blades. Items to be renewed as indicated in opening Inspection report	Bidder
			3	Balancing of Propeller Shaft & Propeller to be carried out	Bidder
			4	Balancing of Fans Impellers of ATU as well as Boat & battery Fan to be carried out	Bidder
			5	Shafting Alignment. Reaming for Hollow spring coupling Bolts	Bidder
			6	Overhaul of Refrigeration & Air Conditioning System components. R22 Gas to be Supplied by Bidder till commissioning	Bidder
			7	Overhaul of Halon Gas Cylinders and filling of Halon Gas through MDL approved contractor (M/S Air O weld) is contractor scope	Bidder
			8	Nitrogen Charging of Accumulators to be carried out. UHP N2 to be used in Bidders Scope	Bidder

			9	Overhaul of Hydraulic Oil station to be done. Work Involves degutting of Oil Station Emptying of Oil Tanks. Survey of Oil tank after blasting to Bare metal (Blasting will be done by MDL). Overhaul & Pressure Test of Oil Tank. Manufacturing of Internal & External Pipes. Internal gaskets, all fasteners of Oil Station and rubber hoses and compensators to be renewed Tank gauging to be carried out and new gauge glasses to be manufactured. Maximator & accessories to be overhauled. Hydraulic Circulating pump to be overhauled, Pump Control block to be overhauled. Trials to be conducted in workshop	Bidder
			10	Overhaul of Hydraulic System components like Control Blocks, Solenoid Operated Valves, Proportionate Valves, Hydraulic motors, Pumps, isolation valves, Relief & Safety Valves, to be carried out in Hydraulic Clean Room certified to ISO Class 8. Filtered oil of NAS 1638 Class 5 and Below to be used for Workshop Testing & Trials.	Bidder
			11	Machining Activity, Lapping , Drilling, Tapping, Dechroming & hard Chrome plating, Galvanizing etc. if required to be done by Sub Contractor	Bidder
			12	Carry out general overhaul as per technical manual	Bidder
			13	Inspection of Renewed of Spares (Material in Sub-Contractor Scope) prior boxing up. Boxing up inspection to be carried out. (Material Test Certificate to be provided for supplied spares)	Bidder
			14	Pressure if Applicable to be carried out after overhaul	Bidder
			15	Functional test to be carried out in Workshop Prior Onboard Fitment. To be witnessed by MDL QA & SRMT	Bidder
			16	Bidder has to get painting activity done from MDL Nominated Painting Subcontractor for MRLC2	Bidder/ Paint Sub-contractor
IX	Survey, Repair / Renewal of Pipe Supports, Pipe Foundations , UCMC Clamps, IKLN	Piping System			
			1	Contractor to manufacture of all supports as per technical manuals, specification, standers etc. (involves wood, lead sheets, angle plates, Rubber, Ebonite, Tafel, Metal Clamps and associated fasteners). All Material & Manufacturing consumables (lead sheets, rubber, adhesive, Welding Consumables including gases Viz-Argon Gas, MDL approved filler wire, Electrodes etc.) will	Bidder

	Clamps, Wooden Supports , Tafel & Ebonite Supports			be in Subcontractors scope. Material Certificates to be provided.	
			2	Prepare the pipe clamps/ pipe supports, get it painted & fix the rubber pads prior to the installation of pipes.	Bidder
			3	Non Destructive testing such as visual, DP, Radiography as per QAP	Bidder
			4	Non Destructive testing , dark room & pit room facility will be provided by MDL	MDL
			5	Painting of Metal Supports to be carried out from MDL Nominated Painting Subcontractor Fire Proof Coating of wooden part to be done by Bidders as mentioned in documents/ TM etc.	Bidder
X	A. Painting of Pipes, Supports, Foundations & seating's	Piping System			
			1	Painting of Pipes, Supports, Foundations & seating's to be carried out from MDL Nominated Painting Subcontractor	Bidder
XI	B. Painting of Equipment & Associated Foundations	Engg System			
			1	Survey of Nonmetal Supports. Survey of Metal Supports to be done from MDL Nominated agency	Bidder
XII	Pipe Penetrations in Sound Proof & PT Bulkheads, Escape Trunk etc. Clearance prior installation	Piping System			
			1	Survey of Penetrations in Sound Proof & PT Bulkheads, Escape Trunk, Shown to Q.A. (EY)/RMT/IN for their acceptance and approval. Rectification if any is to be carried out by contactor.	Bidder
			2	Pressure Test of Penetrations prior to installation onboard. Shown to Q.A. (EY)/RMT/IN for their acceptance and approval.	Bidder
XIII	Installation of Pipes and in Line devices	Piping System			
			1	All inline RENEW valves, Devices as per DL will be provided by MDL.	MDL
			2	Ensure clearance for Penetrations from Hull - MDL prior to Installation of pipes & valves of PT Bulkhead, Sound Proof Bulkhead, Tank Penetrations, Escape Trunk etc.	Bidder
			3	Pre installation inspection i.e. inspection of fasteners, gaskets, shims, tafel Sheet, device to be installed etc. to be carried out with QA & RMT.	Bidder
			4	Installation of Pipes, valves and devices based as per sequence (Last Out-First in). Preparation area for installation of pipes, pipes associated fittings, valves,	Bidder

				devices is the responsibility of the Contractor.	
			5	Installation of Foundations, seating, Clamps, shims, Zinc Ring, Metal & Nonmetal Supports (involves wood, angle plates, Rubber, Ebonite, Tafel, Metal Clamps, adhesive etc.) with associated fasteners and hardware as per drawing and specification	Bidder
			6	Renewal & Installation of Insulating Bush, Washers & Sleeves. (All material in Sub Contractor Scope). Continuity Measurements to be shown to QA-RMT.	Bidder
			7	Installation of pipes, pipes associated fittings, valves, devices arising due to Mandatory System Upgradation or modification due to site requirement.	Bidder
			8	Installation of inline piping system items like bellows, hoses, pressure gauges, pressure transmitter, minimizer, sensors, pressure switches, limit switches, thermometer, hose coupling etc…, are within the scope of pipe installation.	Bidder
			9	Fasteners, other fittings such as adaptors, bushes, washers, and joints etc. required for Installation of activities to be renewed by Bidder as per Standard mentioned in Part List, Drawings, TM. Material certificates to be provided. However, Contractor has to preserve old items removed from the submarine and reconcile after completion of the system.	Bidder
			10	Gaskets, O-rings, resilient mounts, Pipe Connectors, adaptors etc. as per part list and site requirements required for Installation of Pipes & for Valves will be in sub-contractor scope. Material certificates to be provided.	Bidder
			11	A list of fasteners, spare parts/ fittings required for re-installation is to be prepared by the Contractor in advance by referring the related Drawing, Part List & TM.	Bidder
			12	The Contractor is to ensure not to damage any fitting/pipe during reinstallation and pressure testing. In the event of damage to any pipes, pipes associated fittings, valves, devices the cost of the same will be recoverable from the Contractor.	Bidder
			13	Any Measuring instruments used by the Contractor should have proper Calibration Certificate.	Bidder
			14	All open-ended pipes, pipes associated fittings, valves, devices should always be kept plugged or capped to prevent dirt entering the fittings/ equipment.	Bidder
			15	Insulation of Pipes and Inline valves / Devices: Pipes and Inline valves/Devices of different system are to be insulated as per Scope attached **Annexure D.**	Bidder

				List will be provided by MDL.	
			16	Insulation checks of Pipe Liner Material, Flanged Joints & Supports for Pipes & Devices: - Renewal & Installation of Insulating Bush, Washers & Sleeves etc. (All material in Sub Contractor Scope). Continuity Measurements to be shown to QA-RMT. Material certificates to be provided. Shown to Q.A. (EY)/RMT/IN for their acceptance and approval.	Bidder
			17	The pipe system, in layer will have to be offered to Q.A. (EY) for intermediate installation checks (I.I. check) and after completion of I.I. check, the pipes in layer will be pressure tested and further clearance is to be obtained from Q.A. (EY)/RMT/IN. Then next layer of pipes are to be installed thereafter & same procedure is followed for other layer of pipes.	Bidder
			18	The Contractor is to get re-installed pipes, pipes associated fittings, valves, devices cleared by ***MDL-QA/RMT (Refit Monitoring Team)/ IN.*** The Contractor, to the entire satisfaction of ***MDL-QA/RMT (Refit Monitoring Team)/ IN*** should rectify the defects while taking trials on Contractor's fitted items.	Bidder
			19	Pre-installation inspection, Stage (Part) installation inspection, installation inspection (II), final inspection (FI) to be carried out as per the Part protocols/ Full Protocols. Maintain the record in soft (Excel and scanned copies) as well as hard form.	Bidder
			20	Installation Inspection of Pipes and Inline Devices by MDLQA & SRMT as per QA protocols. Shown to Q.A. (EY)/RMT/IN for their acceptance and approval.	Bidder
XIV	Installation of Equipments	Engg System			
			1	Refer **Annexure-B** for List of equipment zone wise	
			2	Pre installation inspection (inspection of fasteners, gaskets, equipment to be installed etc.) of Equipment to be installed to be carried out with QA & RMT. Post pre installation inspection Pre Assembly of Equipment to be done if required.	Bidder
			3	Alignment Checks to be carried out as per prescribed procedure. Alignment of Pumps with motor and trail are with contractor scope	Bidder
			4	All carbon steel fasteners to be renewed. Shim plates to be renewed for alignment.	Bidder
			5	All Accessories & mountings to be installed along with equipment.	Bidder
			6	Pre-Equipment Installation activities like Drilling, Reaming, blue Matching, Machining, tapping, Torqing etc. along with required tools will be Sub Contractor Scope.	Bidder
			7	Consumables for Equipment Installation like Rust	Bidder

				Releasant, grease, Emery Paper, Coolant for Machining, Oils , Adhesives will be in subcontractor scope.	
			8	Free height and compressed height of shock mounts to be measured using calibrated laser distance meter.	Bidder
			9	Packing Material like Joining Sheets & gaskets, Rubber Sheet, Tafel, Ebonite, Lead Sheet, Profile Rubbers, Teflon etc. will be in subcontractor scope.	Bidder
			10	Installation inspection to be offered to QA/RMT/Trial Authority till clearance.	Bidder
			11	Torque tightening (with valid calibration certificate) along with proper tools and its inspection as mentioned in the Drg. will be in subcontractor scope.	Bidder
			12	Equipment Hygiene and Protection to be ensured with Fire Proof Protection sheet. In the event of damage to the equipment aroused due to non-protection of the Equipment, the cost of the same will be recoverable from the Contractor.	Bidder
			13	Onboard Maintenance of overhauled equipment, Routine Maintenance to be carried out till Separation. Installed equipments are to be covered using fire protection cloth.	Bidder
			14	Onboard Functional trials of overhauled equipment and liquidation of defects.	Bidder
XV	Installation & Pressure Testing of Hull & Doubler Valves	Piping System			
			1	Ensure Hull & Engg Structural Survey clearance for Pressure Hull penetrations from QA dept.	Bidder
			2	Blue Matching of Mating surfaces of Hull penetrations (Inside & Outside Hull) prior installation. Template Surface Plates to be provided by bidder. After Blue Matching clearance protective covers to be placed on penetration faces. Inspection of blue Matching to be carried out.	Bidder
			3	Removal damaged Threaded Studs followed by Cleaning of female Threads of Hull Valves fasteners as per survey report. Damaged/Seized Studs to be removed by Cutting, drilling, and tapping.	Bidder
			4	Pre installation inspection i.e. inspection of fasteners, gaskets, Hull-doubler valve to be installed etc.to be carried out with QA & RMT.	Bidder
			5	Installation & Pressure Test as per Approved QAP.	Bidder
			6	Torque tightening (with valid calibration certificate) along with proper tools and its inspection as	Bidder

				mentioned in the Drawing will be in subcontractor scope.	
XVI	Section Wise Pipe Pressure Testing	Piping System	Contractor has to carryout Pressure Testing of all installed pipes with inline valves & devices on board of respective Section (Zone) to prove pipe installation integrity as per specification by respective vendors.		
XVII	Pressure Test & Flushing of Pipes, valves, devices on board / inside submarine	Piping System	Contractor has to carryout System Wise Pressure Test & flush of Pipes with inline valves & devices on board for Entire Submarine by concerned vendor.		
			1	System wise Pressure Testing to be carried out by contractor as per Pressure Testing Protocols for **entire boat**	Bidder
			2	For Leak Test, Pressure test, flushing of the Pipes on board submarine, all the adaptors, blanks, flanges, end fittings, gasket, "O" rings etc. are in contractors scope.	Bidder
			3	Pressure testing is to be carried out round the clock in 3 shifts, each of 8 hours' duration. (including Saturday, Sunday and Holidays)	Bidder
			4	Testing Equipment like Pneumatic bilge clearing pumps, HP Air Compressors (350 Bar), LP Air Compressor, Cascade Cylinders, Hydraulic (water) Testing Pumps, Air Operated Testing Pumps, Centrifugal Pumps, Vacuum Pumps, Testing Manifolds, Hydraulic Power Packs (200 Bar) will be in Sub Contractor Scope. Redundancy in case of arising defects must be activated within 24 hrs. after breakdown of pressure testing equipment. Considering criticality of system readiness. 2 Nos. Hydraulic flushing station are to be operational at given time.	Bidder
			5	The pipe system, in layer will have to be offered to Q.A. (EY) for intermediate installation checks (I.I. check) and after completion of I.I. check, the pipes in layer will be pressure tested and further clearance is to be obtained from Q.A. (EY)/RMT/IN. Then next layer of pipes are to be installed thereafter & same procedure is followed for other layer of pipes.	Bidder
			6	Conductivity checks to be carried out prior pressure test. Carry out pressure test of the individual system pipes as per the specification, using the test media specified for the individual system & as per the Part Protocol, full Protocol and offer / shown to Q.A. (EY)/RMT/IN for their acceptance.	Bidder
			7	While Pressure testing, all the valves/ fittings/ filters/ hydraulic blocks/ hoses are also to be tested along with the pipes. Any leaks observed are to be rectified by the Contractor which is under taken by them. O-rings, gasket, seals required for rectifications of the	Bidder

				leak and pressure test are in contractor's scope.	
			8	Vacuum test to be carried out for H2 – Measuring system as per protocol mentioned and offer / Shown to Q.A. (EY)/RMT/IN for their acceptance and approval. Vacuum pump and Vacuum gauge is in Contractor scope.	Bidder
			9	Flushing & Testing medium to be Arranged by Sub Contractor (Oil, Nitrogen, Refrigerant, Compressed Air (8 Bar to 350 Bar)	Bidder
			10	Flushing to Be carried for Hydraulics System, Lub Oil System, Oxygen System, BIBS System, Battery Distillate System, Diesel Fresh Water Cooling System	Bidder
			11	Pre Flushing of Hydraulic Oil & Lub oil to be carried out	Bidder
			12	Cleanliness is the vital importance for a Submarine System, specially the hydraulic system. Hence the Contractor has to take utmost care not to allow any dirt to go inside any system pipes. Extreme care is to be taken and hygiene is to be maintained while flushing, pressure testing and blowing through the system.	Bidder
			13	**Hydraulic Flushing**	
			a	Flushing & Pressure Test equipment & Accessories like Filters, Valves, Hoses, Manifolds, Pressure Gauges, Fittings, Calibrated Contamination meters, Clean Sterilized Screw Cap Glass Bottles (for oil samples checking) will be in Subcontractors Scope. Subcontractor must ensure that Minimum of 2 Flushing Station must be operational round the clock. 2 Nos. Flushing portable station having pressure capacity of 200 Bar, flushing at approx. 150 Litres / min. at 25 bar with Bi-directional valves, magnetic in line filter with contamination indicators (in suction and discharge line, 2 Nos. for each pump) for separating metal particles to achieve **NAS-3 value**, temp. cut off, emergency shutoff valve, necessary fittings, adaptors, blanks, man power (min. 2 manpower's for each station) will be in Contractors' scope of supply. Each station must have stand by flushing pump. Redundancy in case of arising defects must be activated within 24 hrs. after breakdown of Flushing Equipment. Considering criticality of system readiness.	Bidder
			b	Flushing to be carried out by looping a number of pipes by using hoses / bridges / rinsing plates as per IN documents at a time as per normal bore for a specific period of time to the required micron accuracy, acceptable (Value NAS 3) to MDL Q.C. and *RMT (Refit*	Bidder

				Monitoring Team) Before flushing of pipe loops, all loops are to be pressure tested with nitrogen to ensure the tightness of the pipe joints. (Approx. 100 Nitrogen cylinder required) Also after the flushing, pipes to be drained by blowing off with UHPN2. Pipes to be re-installed, re-inspected and re-pressure tested by UHPN2 before pressure testing through hydraulic oil.	
				c	Prior to commencing flushing of the hydraulic pipes, the Hydraulic Oil stored in the drum will also have to be flushed to NAS value-3 to ensure that the same is free of dust/ metal particles	Bidder
				d	Hydraulic oil HLP-32 for flushing, pressure testing, hydraulic trials, charging of hydraulic station etc. is in sub-contractors' scope. 30 drums – 210 Litre each (Approx. 6300 litres.) Contaminated oil to be disposed off by subcontractor with concurrence of MDL	Bidder
				e	Flushing operation is to be carried out round the clock in 3 shifts, each of 8 hours' duration (including Saturday, Sunday and Holidays).	Bidder
				f	Results (Value NAS 3) of Hydraulic Flushing to be interpreted on inline Calibrated meters with Print Function. Results (Value NAS 3) will be considered valid after submitting supporting lab check report for same sample and Shown to Q.A. (EY)/RMT/IN for their acceptance and approval. Lab test of oil samples is in contractor's scope. Oil samples to be taken in Clean Sterilized Screw Cap Glass Bottles as specified by MDL	Bidder
				g	Pressure Testing of Hydraulic Pipes as per part protocol and full protocol will be also in Contractors' Scope of Work and offer to Q.A. (EY)/RMT/IN for their acceptance and approval. Pipes to be pressure tested through nitrogen before pressure testing through hydraulic oil.	Bidder
				14	**Lube Oil Flushing**- Flushing Equipment & Medium in Subcontractor scope Lube Oil Flushing to be carried out using once through technique	Bidder
				15	**Battery Distillate Pipes Flushing-** Flushing Equipment & Medium in Subcontractor scope Battery Distillate Pipes to be Flushed using Distilled water and caustic soda as medium. Equipment to be arranged by Sub contractor	Bidder

			16	**BIBS System Pipes Flushing-** Flushing Equipment & Medium in Subcontractor scope BIBS System pipes to be flushed using UHP Nitrogen	Bidder
			17	**Oxygen System Flushing-**Flushing Equipment in Subcontractor scope. Pipes to be Flushed using Warm Water and caustic soda as medium. Equipment to be arranged by Sub contractor.	Bidder
			18	Diesel Freshwater Cooling System Flushing using Freshwater as medium. Flushing Equipment in Subcontractor scope STEP 1 - The flushing is to be repeated until pH value before and after flushing remains constant. STEP 2 - If The pH Value does not remain constant then flushing will be done with MDL Approved cleansing agent followed by flushing with freshwater to achieve the constant pH Value. STEP 3 - If the pH Value still not remains the same. Relishing to be done after cleaning of diesel components by Equipment Sub-Contractor	Bidder
			19	On completion of flushing, systems to be re-installed, re-inspected and re-pressure tested as per Protocol and shown to Q.A. (EY)/RMT/IN for their acceptance and approval.	Bidder
			20	Leak testing is a part of pressure testing only. All arrangements for leak test and pressure test is in supplier scope.	Bidder
			21	Pressure testing of systems will be considered as one activity only irrespective of no of pipes and connected system pipes, for pressure testing of any particular system, the pipes of other system are to be tested along with the system will be considered as a pressure testing of same system. No extra cost will be paid. Pressure testing of the system will be considered as one activity only till successful completion (till acceptance of Q.A. (EY)/RMT/IN) of the pressure testing of that system irrespective of number of unsuccessful attempts. Part protocol pressure testing of on board is integral part of system pressure test only.	Bidder
XVIII	Calibration of Pressure Gauges	Piping System	1	Each Onboard Pressure Gauges to be calibrated from NABL accredited Lab before fitment. Calibration to be done every year during course of Refit.	Bidder
	STW and Test and Trials	Piping System	1	Assistance to be provided for setting to work and observation if any to be liquidated during HATs and SATs.	Bidder

XIX	General House Keeping	Piping /Engg System	1	Sub-Contractor to carry out work adhering to applicable safety Norms and operating procedures. Hygiene of work environment to be maintained by Ensuring deployment of own House keeping personnel and supervisor. Events of Spillage, Leakage of water & oils arising during onboard pressure test must be attended by Subcontractor	Bidder
				Cleanliness is the vital importance for a Submarine System, specially the hydraulic system. Hence the Contractor has to take utmost care not to allow any dirt to go inside any system pipes. Extreme care is to be taken and hygiene is to be maintained while flushing, pressure testing and blowing through the system	Bidder
XX	Safety	Piping /Engg System	1	1) Safety Certificates All Pressure Testing accessories like manifolds, Hoses , Needle valve, ball Valve to be provided 2) Calibrated Pressure gauges to be used for Pressure test 3) Onboard Relief valves and safety valves to be set in workshop prior fitment. 4) Onboard Lifting Shifting, will be in sub-contractor's scope. Sub-contractor to use load tested lifting gear and trained rigging personnel to be deployed. Crane will be provided by MDL. 5) Internal Transportation within MDL Premises will be in Sub Contractor Scope 6) Necessary Safety permits to be obtained for onboard work	Bidder
XXI	Performanc e/ Guarantee	Piping & Engg System		The Firm has to stand Guarantee of their job for **18 Months** from the date of separation of Submarine from the pontoon. Any other failures of the engineering system observed, during Setting to Work/HATs, also to be rectified by the firm up to the satisfaction of ***MDL-QA/RMT (Refit Monitoring Team)/ IN.***	Bidder

Annexure : B
Engineering Equipment Zone list

Sr No.	Sub Sr.No	Equipment Description	SEC	Qty
Zone 1		***Section 10 ,20 , AFT MBT Pipes + Inline valves & devices + Equipments mentioned below+ Section Pipe Pressure Testing***		
		Refer: Annexure A - SoW for Piping works and Engineering works Annexure C - SoW of Equipments		
1	1	Main Propulsion Motor (EPM) with **shock mounts**(10Nos)	10	1
2	2	Air Coolers No. 1 - No. 2 for EPM	10	2
3	3	Turning Motor for EPM	10	1
4	4	Hydrazine Cylinders(Aft)	10	2
5	5	Hydraulic coverter Hydraulics (only removal)	20	1
6	6	Diesel Engines No. 1,2,3&4 with shockmounts	20	4
7	7	Generators No. 1,2,3&4 with shockmounts	20	4
8	8	Individual Silencer 1,2,3&4	20	4
9	9	Diesel Engine Pre heating Pump 1,2,3& 4	20	4
10	10	Diesel Exhaust cooling (double jacket)truncking (Port) and(Stbd)	20	2
11	11	Combined Silencer (Port and Stbd)	20	2
12	12	Trunking between Combined Silencer and Inner Exhaust Valve(Port and Stbd)	20	2
13	13	Inner Exhaust Valves (Port and Stbd)	31	2
14	14	Outer Exhaust Valves (Port and Stbd)	50	2
15	15	Change over Flap with driving mechanism and Trunking	50	2
16	16	Outer Exhaust Trunking	50	2
17	17	Main Cooling Sea Water Pump	10	1
18	18	RO Plant	10	1
19	19	Chilled Water Expansion Tank	10	1
20	20	Chilled Water Pump No. 1 - No. 2	10	2

21	21	Aft Maint vent Hyd. Block + Main motors+Drive and Rod gearings including main vent flap	10	2
22	22	Nitrogen Cylinder	10	1
23	23	Hydraulic Oil Accumulators NO. 1 - No. 11	10	11
24	24	Chilled Water Evaporator No. 1,2& 3(Chiller Unit)	10/20	3
25	25	A/C **Compressor** No. 1,2&3	10/20	3
26	26	A/C Compressor Electric **Motor** No. 1 - No. 3	10/20	3
27	27	A/C **Condensers** No. 1 - No. 3	10/20	3
28	28	A/C Cooling Sea Water **Pump** No. 1 - No. 3	10/20	3
29	29	A/C **Compressor Control panel** No. 1 - No. 2 No 3	10/20	3
30	30	Fuel Water Separator	20	1
31	31	Prelubricating Oil Starting Pumps No. 1,2,3& 4	20	4
32	32	Luboil Bypass Duplex filter	20	8
33	33	Diesel Fresh Water Electric Preheater	20	4
34	34	Diesel Fresh Water Preheater Pumps No 1. - No. 4	20	4
35	35	Acid Circulating compressor	20	2
36	36	Acid circulation Air Flow Panel	20	1
37	37	Bilge Pump No. 1	20	1
38	38	Halon Gas Cylinder(For Engines)	20	2
39	39	Battery Room Fan	20	1
40	40	Boat's Air Cooler	20	1
41	41	Boat Fan	20	1
42	42	ATU K1- for Engine Room	20	1
43	43	ATU K2 - for Control Room , Radio Room & Switchboard Spaces	20	1
44	44	High Pressure Air Dryer	20	1
45	45	Air Compressors No.1 - No.2	20	2
46	46	Maximator(Air operated Hydraulic pump)	20	1
47	47	Hydraulic Oil Circulation Pump	20	1
48	48	Hydraulic Oil Pumps No. 1 - No. 4	20	4
49	49	Field Rehostat	20	1
Zone 2:		***Sec 31 and 32 Pipes+inline valves & devices + Equipments mentioned below + Section Pipe Pressure Testing***		

		Refer: Annexure A - SoW for Piping works and Engineering works Annexure C - SoW of Equipments		
50	1	Auciliary Switchborad **Shock Mounts ((9+7=16 Nos)**	31	16
51	2	Main & Generator Switchboard **Shock Mounts**	31	22
52	3	Steering Control Console **shock mounts**	31	12
53	4	Reserve Bouyancy meter	31	1
54	5	Signal Ejector (Aft & Fwd)	31	2
55	6	Pepenburg in Steering stand	31	1
56	7	Distillate Cooler NO. 1 - No. 2	31	2
57	8	Distilled water Twin pump	31	2
58	9	Ion Exchanger	31	7
59	10	Distillate Filling Pump	32	1
60	11	H2-Measuring Eqipment	31	1
61	12	Bilge Pump No.2	31	1
62	13	Water Man's Station	31	1
63	14	Halon Gas Cylinder(for Battery room 1 & 2)	31/32	2
64	15	Drinking Water Cooler	32	1
65	16	Drinking Water Pressure Tank	31	1
66	17	Wash Water Pressure Tank	31	1
67	18	Electric Jacket Heater No.1 - No.2(Flow heater)	31	2
68	19	Wash Water Pump & Drinking Water Pump	31	1
69	20	WC aggregate	31	2
70	21	Breathing Gas Cylinder No. 1,2,3&4(BIBS)	31	4
71	22	A/C Cooling Chilled Water Condensor(for Ref plant)	31	1
72	23	ATU K3 -for CIC	31	1
73	24	ATU K4 -for Commanding Officer's Cabin & Galley	31	1
74	25	ATU K5 -for Living Quarters	31	1

75	26	Compressor No.1 & No.2 For Refrigerating Provision Cooling	31	2
76	27	Refrigirating Plant Control Panel	31	1
77	28	Oil Separator For Refrigerating Provision Cooling	31	1
78	29	Receiver For Cooling chilled Water Condenser?	31	1
79	30	Liquid Separator For Refrigirating Provisions Cooling	31	1
80	31	HP Air Manifold	31	7
81	32	Hydraulic Oil Motor For Exhaust Gas Valve STBD Side	31	1
82	33	Hydraulic Oil Motor For Exhaust Gas Valve Port Side	31	1
83	34	Hydraulic Oil Motor Warping Drum	31	1
84	35	Hydraulic hand Pump (Emergency Steering)	31	1
85	36	Hydraulic Oil Motor For Outboard Exhaust Flap STBD Side	31	1
86	37	Hydraulic Oil Motor For Outboard Exhaust Flap Port Side	31	1
87	38	**Silicon Oil** Circulation **Accumulator** For Rod Antenna	31	2
88	39	Hydraulic Oil **Motor** For **Radar Turning**	31	1
89	40	Hydraulic Oil **Motor** For Last **Man's Bridge Fin**	31	1
90	41	Hydraulic Oil **Motor** For **Flood Cock Bridge Fin**	31	1
91	42	Hydraulic Oil Hand Pump (Escape Hydraulics)	31	1
92	43	Hydraulic Oil Accumulator For Access Trunk	32	1
93	44	Hydraulic Oil Accumulator For Bulkhead Hydraulic	32	1
94	45	Hydraulic Oil Swing Motor For Emergency Oparation Bulkhead cocks	32	1
95	46	Inner and Outer Snorkel Valve	31	2
96	47	Pneuamtic Cylinder for Circuit Breaker	31	1
97	48	Mast Control Block	31	1
Zone 3:		***Sec 41,42 ,Fwd MBT and 50 Pipes+inline valves & devices + Equipments mentioned below +Section Pipe Pressure Testing***		
		Refer: Annexure A - SoW for Piping works and Engineering works Annexure C - SoW of Equipments		

98	1	O_2 Cylinder Group	32/41	26
99	2	Snorkel Mast	50	1
100	3	Hydrazine Cylinders(Fwd)	42	10
101	4	Garbage Ejector	41	1
102	5	HP Air Cylinder (Group 2) at Fwd MBT	41	6
103	6	Hydraulic Oil Accumlator For Tropedo Hydraulic	41	1
104	7	Fwd Maint vent Hyd. Block + Main motors+Drive and Rod gearings including main vent flap	41	1
105	8	Hand Control Slide Valve For Vertical Transport Equipment Torpedos Port Side	41	1
106	9	Hydraulic Oil Motor For Longitudinal Transport Equipment Torpedos	41	1
107	10	Hydraulic Oil Motor For Anchor Windlass	41	1
108	11	Hydraulic Oil Motor For Torpedo Hydraulic	41	1
109	12	Hand Control Slide Valve For Vertical Transport Equipment Torpedos STBD Side	41	1
110	13	HP Air Cylinder (Group 4) at Fwd MBT	42	6
111	14	HP Air Cylinder (Group 3) at Bridge Fin	50	4
112	15	Mine Saddle Hook	50	4
Zone 4:		***Steering and Shafting systems***		
		Refer:Annexure C - SoW of Equipments		
113	1	Propeller Shaft	10	1
114	2	Propeller, Propeller cone and Shaft Brake	10	1
115	3	Stern Gland	10	1
116	4	Stern Tube bearing	10	2
117	5	Flange coupling-Intermediate coupling-Hollow spring coupling with all Fitbolts	10	1
118	6	Thurst Bearing	10	1

119	7	Hydraulic Oil **Drive** For Aft Steering (Hydoplane and Rudder)	10	2
120	8	Rudder blade (Upper and lower)	10	2
121	9	Aft Steering Linkages	10	2
122	10	Aft Hydro Plane blades (Port) and (stbd)	10	2
123	11	Hydraulic Oil **Drive** For Fwd Steering	42	2
124	12	Fwd Hydro Plane blades (Port) and (stbd)	42	2
125	13	Fwd Steering Linkages	42	2

Annexure -C-SCOPE OF WORK FOR PIPE CLEANING AND THICKNESS GAUGING

1. SCOPE

Rate contract for cleaning of pipes (inclusive of supply of all chemicals, de-greasing, descaling, and removal of paints, flushing of pipes and associated work as detailed below). The general technical notes and procedure detailed below at Para 2 onwards shall be applicable for execution of work: -

2. Pipe Material

I. Stainless Steel.
II. Copper /CU-Alloy
III. 90/10 Cu-Ni
IV. Carbon Steel.
V. End Connection — Flanged or screwed ends.
VI. Hoses – Rubber or else
VII. The general technical notes and procedures detailed below shall be applicable for the execution of the work.

3. TANKS FOR PIPE CLEANING WORK

THREE TANKS REQUIRED FOR CLEANING

The following three tanks with electrical heaters (110 Volts) are to be arranged by contractor for pipe cleaning work in MDL East Yard Pipe Shop, covered space with water and electricity will be provided by MDL.

I. Tank No 1: 3600 mm x 1300 mm x 1000 mm
II. Tank No 2: 5700 mm x 1400 mm x 1000 mm – SS Tank
III. Tank No 3: 5700 mm x 1400 mm x 1000 mm – SS Tank

STAGE — I

HANDING OVER OF PIPES TO SUB-CONTRACTOR

All removal of pipes from on-board submarine shall be done by sub-contractor.
The pipes after removal and from the submarine should be taken by the sub-contractor for Pipe Cleaning and associated activity followed by Thickness gauging as per procedure by Subcontractor and same to be offered to QA/RMT/TPI.

The sub-contractor should maintain a proper register book/record (Soft copy & Hard Copy) to record all pipes received/ returned every day. Each and every pipe will carry metallic tally plate (with respective pipe number punched on it) duly tightened with metallic wire onto the pipe.

These tallies are the identification reference of the pipes and the same are not to be misplaced /removed or damaged by the sub-contractor during the entire cleaning operations. Please note that proper preservation of the original tally plates, duly attached to the respective pipes is most critical for subsequent installation on board.

STAGE —2

CLEANING OF PIPES BY SUB-CONTRACTOR
ALKALINE CLEANING IN TANK NO 1

After receiving and recording the pipes, the sub-contractor should clean the pipes with alkaline solution **ASFOCLEAN-B** (approx. 30 % conc. at 40 to 60 Deg C or as required for proper pipe cleaning process) in **Tank No 1.**

PAINT REMOVAL IN TANKS NO 2.

Thereafter the pipes will be dipped in alkaline solution **INDROX 664** (100 % concentration at room temperature or as required for proper pipe cleaning process) in **Tank No 2** for time ranging up to 24 hours to remove the paint and de-scaling.

HOT WATER CLEANING OF PIPES & REMOVAL OF CHEMICALS IN TANK NO 3

Further the pipes will have to be cleaned with jet of water and compressed air to remove all traces of paint/ traces of chemicals. Thereafter the pipes will be immersed in **HOT WATER TANK NO 3.** (Approx. Temp 40 to 60 Deg C or as required for proper pipe cleaning process to remove all scales.) The pipes will be wiped clean and handed over to store (Storing arrangement/location) by proper record/memo/list.

STAGE - 3

SURVEY, REPAIR AND PRESSURE TEST.

After cleaning of pipes, subcontractor should process the pipes for survey and inspection by MDL (EY-QA) & Refit Monitoring Team and subsequent repairs (including renewal/replacement of "ERMETO" fittings/ "0" rings/ screwed couplings as necessary).

Every pipe (except Carbon Steel pipes) which has been removed from the submarine has to be offered for Inspection to QA (E-Y)/SOT for thickness gauging after cleaning. The inspection shall valid for accepting OR rejecting the pipes based on the thickness gauging. A record is to be maintained for every pipe which is cleaned and gauged for thickness. An evaluation chart/value will be provided to subcontractor on the basis of which the pipes will be gauged /checked for thickness.

The pipes which will be rejected in the gauging inspection shall be recorded and shall be taken for manufacturing new pipes. The rejected pipe shall be taken to storage space/location with record.

The record of rejected pipes shall be provided by the subcontractor for manufacturing of new pipes.

The pipes will be Hydraulic Pressure Tested by fabrication subcontractor duly witnessed MDL (EY-QA) & Refit Monitoring Team.

The pipes which have been rejected during pressure testing/inspection shall be recorded and taken for manufacturing new pipes.

MINOR CLEANING OF PIPES:

Any further minor cleaning of pipe found necessary during the process of various Inspections as above is to be carried out by the sub-contractor.

STAGE -4

FINAL CLEANING IN TANK NO 1

After successful completion of pressure test/hydraulic pressure test contractor should do the FINAL CLEANING with **ASFOCLEAN-B SOLUTION IN TANK NO 1.** The pipes after final cleaning in Tank No 1 will be wiped clean and flushed with dry air by sub-contractor and then will be offered to Q.A (EY)/ Customer for final inspection.
On satisfactory completion of the final inspection and /or instructions the sub-contractor will blank the ends of the pipe with plastic caps. The sub-contractor will also ensure that the tally plate is properly secured to the pipe and hand over the pipe to subcontractor against proper voucher. The pipe cleaning activity of a pipe (other than hydraulic pipe) shall be treated as complete at this stage.

ADDITIONAL TREATMENT FOR HYDRAULIC PIPES.

In addition to the above all Hydraulic Pipes (BGR 4920 — System Symbol X) after hydraulic pressure testing will have to be flushed by the sub-contractor with ASFOCLEAN — **B SOLUTION** in the pressure testing. Thereafter these pipes will have to be flushed with Nitrogen by the sub-contractor (Nitrogen cylinders will be supplied by Engg Dept) and then to be offered to QA (EY) for final inspection required if any. On satisfactory completion of the final inspection and / or instructions the sub-contractor will blank the ends of the pipe with plastic caps. The pipe cleaning activity of a hydraulic pipe shall be treated as complete at this stage.

4. IMPORTANT GENERAL NOTE:

Please note that maintenance of high standard of cleanliness and hygiene, proper handling of pipes during various stages to avoid any damage/ dents, preservation of tally plates and proper blanking of ends with plastic caps is of utmost importance throughout the execution of the contract.

5. DURATION OF THE CONTRACT

The duration of the contract is 36 months from the start date of order for this contract.
The entire work is to be carried out in different phases (Based on the overall schedule of the project) as per MDL instructions from time to time. The contractor will have to make necessary arrangements to work in shifts if required.
The output of cleaning of pipes will have to be up to 300/350 nos. of pipes per week or more as and when required.
Timely completion of the work: Since any delay on part of the Contractor in completing respective stage of the activity will seriously affect the subsequent MDL outfit work and timely completion of this important project, the contractor must ensure that each stage is completed in time duly certified by the inspecting agency strictly in accordance with this schedule by deploying adequate competent manpower, material and facilities required.

6. ACTUAL SCOPE OF WORK & WORK COMPLETION CERTIFICATE

The actual quantum of work shall be as per the requirement at site, as specified by MDL The

approx. length specified above is for guidance and not to be treated as part of the contract. Payment shall be applicable only on the basis of "Unit Rates" specified in the order and the "Actual quantum of work done" duly certified on mutually agreed pro rata basis. The total cost of such miscellaneous cleaning work shall be limited to maximum 5% of the total cleaning work.

On satisfactory completion of the final cleaning and handing over of pipe as per stage —4 above, the firm has to obtain a "Work Completion Certificate ". duly indicating MDL order No, Certificate No & date, details of actual work completed, Inspection clearance reference, certified actual length etc. The format of the certificate is to be finalised with OIC Pipe Shop.

Any activity is to be considered for work completion certification only after clearance by MDL EYQA/RMT/Naval Inspecting Agency. Moreover, the firm should note that any additional/duplicate work or re-work/Minor Cleaning work carried out by the firm due to non-certification by inspecting agency would not be considered as extra work.

MONTHLY PROGRESS REPORT

On the last day of every month the firm to submit a "MONTHLY PROGRESS REORT comprising the following details

Sr. No	Activity	In this Month	Up to last Month	Total
a)	No of pipes received (Stage —1)			
b)	No of pipes cleaned & handed over for survey & pressure test (Stage — 2)			
c)	No of pipes received for final cleaning (Stage — 3)			
d)	Final cleaning completed duly certified (Stage — 4)			
e)	Cost of Completed work (Stage - 4)			

Indicative cost of the bills per month is to be forwarded by the Contractor.

7. MATERIALS & FACILITIES PROVIDED BY MDL.

i) Compressed air as available in EY Pipe Shop.
ii) Fresh Water.
iii) Electric Power.
iv) Temporary Lighting facilities.
v) Crane facilities as available in EY Pipe Shop

8. LABOUR, MATERIAL & OTHER FACILITIES TO BE PROVIDED BY CONTRACTOR

i) Appropriate manpower comprising of the following: -
   a) One full time competent supervisor to co-ordinate all the cleaning and gauging activities
   b) Adequate number of skilled & experienced labours to work in different shifts as per the quantum/requirement of the Jobs and schedule of work.

ii) All required chemicals (such as ASFOCLEAN — B, INDROX -664 with manufacturer's test certificate) are to be arranged by the firm at no extra cost to MDL. The quantity and concentration of chemicals should be sufficient, time to time, to carry out proper

cleaning of pipes in time. Samples of chemicals will be checked by MDL as and when required. Before charging the tanks with the chemicals, clearance to be obtained. Charging and discharging of chemicals is to be carried out by the sub-contractor. The sub-contractor at no extra cost to MDL shall replace chemicals not meeting the requirement.

iii) Nylon brushes of different sizes with long wooden handles.

iv) Cotton cloth pieces for cleaning of pipes, as per sample approved by OIC (Pipe Shop). Use of any other material (such as Jute /Cotton waste) is strictly prohibited.

v) All necessary safety equipment / facilities such as Rubber hand gloves, Rubber Gumboots safety shoes, safety helmet etc.

9. TERMS AND CONDITIONS

i) The Sub-contractor is to comply strictly as per the working schedule forwarded. The detailed work schedule to be made by Subcontractor and submit the same within a week's time after receipt of order.

ii) The Subcontractor to comply strictly all Quality control agency requirements as indicated in respective drawings / technical manuals etc.

iii) QA-EY and RMT will carry out all stage & final inspections. The defects/ rectification after inspections are to be carried out at free of cost. All the pipes cleaned by Subcontractor will be accepted only after the final clearance from RMT.

iv) The Subcontractor has to arrange the required manpower / machines / measuring and other instruments / equipment to complete the scope of work.

v) The Subcontractor will be required to work shift duties including Sundays / holidays as and when required.

vi) The subcontractor should handle all the equipment / machinery supplied by MDL /RMT (if any) with utmost care. The cost of any damage as such will be recovered from the bill.

10. QA REQUIREMENTS:

Pipes should be checked for cleanliness and Gauging/Thickness measurement by QA & RMT.

ANNEXURE-D

SCOPE OF WORK FOR INSULATION OF PIPING SYSTEMS AND DECK COVERING OF SUBMARINE (MRLC-2) AT MDL/ND(MB)

Sr. No.	DESCRIPTION	QTY	Material
1	EXHAUST (A) SYSTEM		
	EXHAUST GAS SYSTEM - Exhaust gas system pipes , trunks and equipment fittings	40 Sq. mt.	Malino Felt of 2 to 3 layers covered with fiber glass cloth and Al sheet, Malimo/Thermofix 20mm. Malimo/alukasch.Tuch 10mm, Malimo doppelt 10mm, glass cloth alukasch.660, Malimo/alukasch. cloth 20mm, line, wire
2	Selected pipes valves & fitting of air conditioning (R-system) as under:		
A	Pipes upto 50 mm OD	170 mts	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
B	pipes above 50 mm to 89 mm OD	46 mts	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
C	Valves and fittings	84 Nos	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
3	Selected pipes valves & fitting of Refrigeration (S-system) as under:		
A	Pipes 50 mm OD	75 mts	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
B	Valves and fittings	53 Nos	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
4	Selected pipes valves & fitting of Fresh water cooling (D-system) as under:		
A	pipes above 50 mm to 76 mm OD	14 mts	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
B	Valves and fittings	12 Nos	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
5	Selected pipes valves & fitting of Fresh water (L-system) as under:		
A	Pipes UPTO 50 mm OD	86 mts	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
B	Valves and fittings	15 nos	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive

Notes: Billing will be done only for actual quantity/ area of job done.

1) MDL's scope

i) All the drawings and relevant documents for insulation will be provided by MDL.

ii) Power supply (110V, 230V) will be provided at free of cost.
iii) Compressed Air supply will be provided by MDL. However, Subcontractor has to arrange his own distribution box along with all accessories.

2) <u>Sub contractor's Scope</u>

i. Contractor to supply all the insulation materials & adhesive
ii. Subcontractor has to prepare/clean surface as per procedure and get cleared from QA-EY & RMT before starting insulation.
iii. Subcontractor should deploy one supervisor and minimum four qualified operatives with previous experience of insulation activities in surface ships or submarine.
iv. All tools required for the job including power tools such as pneumatic grinders, are in subcontractor's scope.
v. All consumables such as cotton waste, diesel or other cleaning agents are in subcontractor's scope.
vi. Calibrated inspection /measuring tools such as digital hygrometer, rubber hammer required for inspection are in subcontractor's scope
vii. Contractor has to arrange his own hose pipes & fittings for pneumatic power tools.
viii. Subcontractor has to keep record qty of materials consumed for different compartments and handover balance material to user Dept. Reconciliation of material supplied to Contractor is in Contractor's Scope which is to be approved by user Dept (MRLC-EY)).
ix. The contractor has to provide all safety gears and personal protective equipments to his employees and they have to follow safety rules and regulations.
x. All stage and final inspections will be carried out by QA(EY) and RMT. The defects /rectification after inspection to be carried out free of cost.
xi. Actual work done area will be considered for WCC and payment.
xii. **Work completion certificate (WCC):** Work Completion Certificate (WCC) shall be issued on satisfactory completion of respective work based on inspection and acceptance reports issued by QA-EY and RMT.
xiii. The subcontractor should handle all equipment with utmost care. Cost of any damage to the equipment and pipes caused by the subcontractor will be recovered from his bills.
xiv. The subcontractor will be required to work in shifts duties including Sundays/ Holidays as and when required.
xv. The subcontractor may have to work at East Yard, MDL, and at Naval Dockyard after undocking of boat from MDL.

ANNEXURE-2

<u>Responsibility Matrix for insulation</u>

Sr. No.	Activity	Responsibility	
		MDL	Sub-contractor
1	Mobilization work		✓
2	Arrangement of Gate pass for personnel		✓
3	Provision of space in MDL for carrying out work	✓	
4	Arrangement of boxes with lockers for safety (for keeping tools & materials)		✓

5	Issue of drawings, Work Instructions, documents	✓	
6	Issue of material & adhesive		✓
7	Collection of Material from MDL		✓
8	Arrangement of transportation trips between MDL stores and sub-contractors premises		✓
9	Preparation of QAP & get it approval from EY design		✓
10	Call for inspections		✓
11	Arranging Inspection	✓	
12	Blasting and priming	✓	
13	Preparation of Reconciliation statement & submission to MDL		✓
14	Handover of balance /left over material		✓
15	Issue of WCC	✓	
16	Submission of invoices for payment		✓
17	Payment for work carried out	✓	
18	Tools and man power for fabrication		✓

ANNEXURE-3

Sample QAP for installation of Insulation

Title: *Exhaust system*

SR. NO.	DESCRIPTION	TYPE OF INSPECTION	REFERENCE DOCUMENT	INSPECTED BY	
				EY-QA	SRMT
1	Surface before insulation	cleanliness	NA	SELF	SELF
2	Malino Felt of 2 to 3 layers covered with fiber glass cloth and Al sheet, Malimo/Thermofix 20mm. Malimo/alukasch.Tuch 10mm, Malimo doppelt 10mm, glass cloth alukasch.660,	Fixing		EY-QA	SRMT

	Malimo/alukasch. cloth 20mm, line, wire				

Title: ***Insulation air-conditioning (R) and refrigeration(S), Fresh water cooling(D), Fresh water (L)***					
SR. NO.	**DESCRIPTION**	**TYPE OF INSPECTION**	**REFERENCE DOCUMENT**	**INSPECTED BY**	
				EY-QA	**SRMT**
1	Surface before insulation	cleanliness	NA	SELF	SELF
3	Misselon sheet / hoses	fitup		EY-QA	SRMT
3	asbestos cloth / fiber glass cloth	fit-up		EY-QA	SRMT

ANNEXURE-4
Quantum of Work

	DESCRIPTION	QTY	MATERIAL
	EXHAUST (A) SYSTEM		
1	Exhaust (A) system pipes , trunks and fittings	70 Sq. mt.	Malino Felt of 2 to 3 layers covered with fiber glass cloth and Al sheet, Malimo/Thermofix 20mm. Malimo/alukasch.Tuch 10mm, Malimo doppelt 10mm, glass cloth alukasch.660, Malimo/alukasch. cloth 20mm, line, wire
2	Selected pipes valves & fitting of air conditioning (R-system) as under:		
A	Pipes upto 50 mm OD	170 mts	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
B	pipes above 50 mm to 89 mm OD	46 mts	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
C	Valves and fittings	84 Nos	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
3	Selected pipes valves & fitting of Refrigeration (S-system) as under:		
A	Pipes 50 mm OD	75	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
B	Valves and fittings	53 Nos	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive

4	Selected pipes valves & fitting of Fresh water cooling (D-system) as under:		
A	pipes above 50 mm to 150 mm OD	14 mts	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
B	Valves and fittings	6 Nos	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
5	Selected pipes valves & fitting of Fresh water (L-system) as under:		
A	Pipes UPTO 50 mm OD	86 mts	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive
B	Valves and fittings	12 nos	Messelon sheet / hoses , asbestos cloth / fiber glass cloth ,Adhesive

Annexure E -Quantum of work for Piping and Engineering work

1) Number of Pipes (Group wise) (Removal, Installation, Pressure Testing, Cleaning)

Sr. No	Mat	Pipe OD Group	Quantity (No. of Pipes)	Unit
1	STAINLESS STEEL PIPE	OD 05-10 mm	871	Nos
2	STAINLESS STEEL PIPE	OD 12-20 mm	1255	Nos
3	STAINLESS STEEL PIPE	OD 22-30 mm	867	Nos
4	STAINLESS STEEL PIPE	OD 32-60 mm	327	Nos
5	CARBON STEEL PIPE	OD 10-30 mm	29	Nos
6	CARBON STEEL PIPE	OD 32-60 mm	50	Nos
7	CARBON STEEL PIPE	OD 60-150 mm	31	Nos
8	CARBON STEEL PIPE	OD 150-220 mm	2	Nos
9	CU/CU-NI PIPE	OD 05-10 mm	590	Nos
10	CU/CU-NI PIPE	OD 12-20 mm	640	Nos
11	CU/CU-NI PIPE	OD 22-30 mm	338	Nos
12	CU/CU-NI PIPE	OD 32-60 mm	677	Nos
13	CU/CU-NI PIPE	OD 60-150 mm	294	Nos
14	CU/CU-NI PIPE	OD 150-220 mm	49	Nos
15	COPPER(SF.Cu) PIPE	OD 05-15 mm	52	Nos
16	COPPER(SF.Cu) PIPE	OD 16-30 mm	25	Nos
17	COPPER(SF.Cu) PIPE	OD 32-60 mm	28	Nos

2) Bending Number of Pipes (Group wise) (Removal, Installation, Pressure Testing, Cleaning)

Sr. No	Mat	OD of Pipe	Quantity (No. of Bends)	Unit
1	STAINLESS STEEL PIPE	OD 05-10 mm	3089	Nos
2	STAINLESS STEEL PIPE	OD 12-20 mm	4450	Nos
3	STAINLESS STEEL PIPE	OD 22-30 mm	3073	Nos
4	STAINLESS STEEL PIPE	OD 32-60 mm	1160	Nos
5	CARBON STEEL PIPE	OD 10-30 mm	101	Nos
6	CARBON STEEL PIPE	OD 32-60 mm	175	Nos
7	CARBON STEEL PIPE	OD 60-150 mm	110	Nos
8	CARBON STEEL PIPE	OD 150-220 mm	8	Nos
9	CU/CU-NI PIPE	OD 05-10 mm	2095	Nos
10	CU/CU-NI PIPE	OD 12-20 mm	2267	Nos
11	CU/CU-NI PIPE	OD 22-30 mm	1207	Nos
12	CU/CU-NI PIPE	OD 32-60 mm	2399	Nos
13	CU/CU-NI PIPE	OD 60-150 mm	1046	Nos
14	CU/CU-NI PIPE	OD 150-220 mm	176	Nos
15	COPPER(SF.Cu) PIPE	OD 05-15 mm	183	Nos
16	COPPER(SF.Cu) PIPE	OD 16-30 mm	90	Nos
17	COPPER(SF.Cu) PIPE	OD 32-60 mm	97	Nos

3) Fabrication of Pipes

Sr. No.	Mat	Pipe OD Group	Quantity (No. of Joints)	Unit
1	STAINLESS STEEL PIPE	OD 05-10 mm	2898	Nos
2	STAINLESS STEEL PIPE	OD 12-20 mm	3752	Nos
3	STAINLESS STEEL PIPE	OD 22-30 mm	2855	Nos
4	STAINLESS STEEL PIPE	OD 32-60 mm	1105	Nos
5	CARBON STEEL PIPE	OD 10-30 mm	101	Nos
6	CARBON STEEL PIPE	OD 32-60 mm	175	Nos
7	CARBON STEEL PIPE	OD 60-150 mm	110	Nos
8	CARBON STEEL PIPE	OD 150-220 mm	8	Nos
9	CU/CU-NI PIPE	OD 05-10 mm	1931	Nos
10	CU/CU-NI PIPE	OD 12-20 mm	2251	Nos
11	CU/CU-NI PIPE	OD 22-30 mm	1191	Nos
12	CU/CU-NI PIPE	OD 32-60 mm	2313	Nos
13	CU/CU-NI PIPE	OD 60-150 mm	1046	Nos
14	CU/CU-NI PIPE	OD 150-220 mm	168	Nos
15	COPPER(SF.Cu) PIPE	OD 05-15 mm	183	Nos
16	COPPER(SF.Cu) PIPE	OD 16-30 mm	90	Nos
17	COPPER(SF.Cu) PIPE	OD 32-60 mm	97	Nos

4) Flushing of Pipes

Sr. No	Mat	Quantity (No. of Pipes)
1	Flushing of Hydraulics System 3 NB	5
2	Flushing of Hydraulics System 5 NB	56
3	Flushing of Hydraulics System 6 NB	72
4	Flushing of Hydraulics System 8 NB	191
5	Flushing of Hydraulics System 10 NB	390
6	Flushing of Hydraulics System 15 NB	165
7	Flushing of Hydraulics System 16 NB	39
8	Flushing of Hydraulics System 20 NB	393
9	Flushing of Hydraulics System 25 NB	147
10	Flushing of Hydraulics System 32 NB	78
11	Flushing of Hydraulics System 40 NB	10
12	Flushing of Hydraulics System 50 NB	14
13	Flushing of Hydraulics System EQUIPMENT	20

b) BIB System

Sr. No	Mat	Quantity (No. of Pipes)
1	Flushing of BIB System 3 NB	12
2	Flushing of BIB System 10 NB	83
3	Flushing of BIB System 16 NB	68
4	Flushing of BIB System 20 NB	95

5	Flushing of BIB System 25 NB	3

Item Category	Description of activity	Qty	UoM

C) Lub. Oil System

Sr. No	Mat	Quantity (No. of Pipes)
1	Flushing of Lub. Oil System 6 NB	40
2	Flushing of Lub. Oil System 8 NB	3
3	Flushing of Lub. Oil System 25 NB	3
4	Flushing of Lub. Oil System 32 NB	138
5	Flushing of Lub. Oil System 50 NB	21
6	Flushing of Lub. Oil System 70 NB	1

d) Hyrdaulic Flexible Hoses

Sr. No	Mat	Quantity (No. of Pipes)
1	Hose Dia. 5mm	1
2	Hose Dia. 8mm	3
3	Hose Dia. 10mm	53
4	Hose Dia. 15mm	55
5	Hose Dia. 20mm	49
6	Hose Dia. 25mm	1
7	Hose Dia. 32mm	1
8	Hose Dia. 40mm	1

e) Fresh Water Cooling System

Sr. No	Mat	Quantity (No. of Pipes)
1	FLUSHING OF F. W. COOLING SYSTEM- 6 mm	60
2	FLUSHING OF F. W. COOLING SYSTEM- 32 mm	47
3	FLUSHING OF F. W. COOLING SYSTEM- 50 mm	9
4	FLUSHING OF F. W. COOLING SYSTEM- 70 mm	7

5) Removal, Overhaul and Installation Valves

10	Valves 250 NB	3	NOS
20	Valves 200 NB	1	NOS
30	Valves 150 NB	21	NOS
40	Valves 100 NB	65	NOS
50	Valves 80 NB	62	NOS
60	Valves 70 NB	18	NOS
70	Valves 50 NB	92	NOS
80	Valves 40 NB	35	NOS
90	Valves 32 NB	96	NOS
100	Valves 25 NB	163	NOS
110	Valves 20 NB	100	NOS
120	Valves 16 NB	140	NOS
130	Valves 10 NB	102	NOS
140	Valves 12 NB	34	NOS
150	Valves 8 NB	80	NOS
160	Valves 6 NB	220	NOS
170	Valves 3 NB	63	NOS

6) REMOVAL, OVERHAULING, RE-INSTALLATION AND TEST & TRIALS OF ENGINEERING WORK

Sr No.	Equipment Description	Qty	Unit
1	Main Propulsion Motor (EPM) with **shock mounts**(10Nos)	1	NOS
2	Air Coolers No. 1 - No. 2 for EPM	2	NOS
3	Turning Motor for EPM	1	NOS
4	Hydrazine Cylinders(Aft)	2	NOS
5	Diesel Engines No. 1,2,3&4	4	NOS
6	Generators No. 1,2,3&4	4	NOS
7	Individual Silencer 1,2,3&4	4	NOS
8	Diesel Engine Pre heating Pump 1,2,3& 4	4	NOS
9	Diesel Exhaust cooling (double jacket)truncking (Port) and(Stbd)	2	NOS
10	Combined Silencer (Port and Stbd)	2	NOS
11	Trunking between Combined Silencer and Inner Exhaust Valve(Port and Stbd)	2	NOS
12	Inner Exhaust Valves (Port and Stbd)	2	NOS
13	Outer Exhaust Valves (Port and Stbd)	2	NOS
14	Change over Flap with driving mechanism and Trunking	2	NOS
15	Outer Exhaust Trunking	2	NOS
16	Main Cooling Sea Water Pump	1	NOS
17	RO Plant	1	NOS
18	Chilled Water Expansion Tank	1	NOS
19	Chilled Water Pump No. 1 - No. 2	2	NOS
20	Aft Maint vent Hyd. Block + Main motors+Drive and Rod gearings including main vent flap	2	NOS
21	Nitrogen Cylinder	1	NOS
22	Hydraulic Oil Accumulators NO. 1 - No. 11	11	NOS

23	Chilled Water Evaporator No. 1,2& 3(Chiller Unit)	3	NOS
24	A/C **Compressor** No. 1,2&3	3	NOS
25	A/C Compressor Electric **Motor** No. 1 - No. 3	3	NOS
26	A/C **Condensers** No. 1 - No. 3	3	NOS
27	A/C Cooling Sea Water **Pump** No. 1 - No. 3	3	NOS
28	A/C **Compressor Control panel** No. 1 - No. 2 No 3	3	NOS
29	Fuel Water Separator	1	NOS
30	Prelubricating Oil Starting Pumps No. 1,2,3& 4	4	NOS
31	Luboil Bypass Duplex filter	8	NOS
32	Diesel Fresh Water Electric Preheater	4	NOS
33	Diesel Fresh Water Preheater Pumps No 1. - No. 4	4	NOS
34	Acid Circulating compressor	2	NOS
35	Acid circulation Air Flow Panel	1	NOS
36	Bilge Pump No. 1	1	NOS
37	Halon Gas Cylinder(For Engines)	2	NOS
38	Battery Room Fan	1	NOS
39	Boat's Air Cooler	1	NOS
40	Boat Fan	1	NOS
41	ATU K1- for Engine Room	1	NOS
42	ATU K2 - for Control Room , Radio Room & Switchboard Spaces	1	NOS
43	High Pressure Air Dryer	1	NOS
44	Air Compressors No.1 - No.2	2	NOS
45	Maximator(Air operated Hydraulic pump)	1	NOS
46	Hydraulic Oil Circulation Pump	1	NOS
47	Hydraulic Oil Pumps No. 1 - No. 4	4	NOS
48	Auciliary Switchborad **Shock Mounts**	1	NOS
49	Main & Generator Switchboard **Shock Mounts**	1	NOS
50	Steering Control Console **shock mounts**	1	NOS
51	Bouyancy meter	1	NOS
52	Signal Ejector (Aft & Fwd)	2	NOS
53	Pepenburg in Steering stand	1	NOS
54	Distillate Cooler NO. 1 - No. 2	2	NOS
55	Distilled water Twin pump	2	NOS
56	Ion Exchanger	7	NOS
57	Distillate Filling Pump	1	NOS
58	H2-Measuring Eqipment	1	NOS
59	Bilge Pump No.2	1	NOS
60	Water Man's Station	1	NOS
61	Halon Gas Cylinder(for Battery room 1 & 2)	2	NOS
62	Drinking Water Cooler	1	NOS
63	Drinking Water Pressure Tank	1	NOS
64	Wash Water Pressure Tank	1	NOS
65	Electric Jacket Heater No.1 - No.2(Flow heater)	2	NOS
66	Wash Water Pump & Drinking Water Pump	1	NOS
67	WC aggregate	2	NOS
68	Breathing Gas Cylinder No. 1,2,3&4(BIBS)	4	NOS

69	A/C Cooling Chilled Water Condensor(for Ref plant)	1	NOS
70	ATU K3 -for CIC	1	NOS
71	ATU K4 -for Commanding Officer's Cabin & Galley	1	NOS
72	ATU K5 -for Living Quarters	1	NOS
73	Compressor No.1 & No.2 For Refrigerating Provision Cooling	2	NOS
74	Refrigirating Plant Control Panel	1	NOS
75	Oil Separator For Refrigerating Provision Cooling	1	NOS
76	Receiver For Cooling chilled Water Condenser?	1	NOS
77	Liquid Separator For Refrigirating Provisions Cooling	1	NOS
78	HP Air Manifold	7	NOS
79	Hydraulic Oil Motor For Exhaust Gas Valve STBD Side	1	NOS
80	Hydraulic Oil Motor For Exhaust Gas Valve Port Side	1	NOS
81	Hydraulic Oil Motor Warping Drum	1	NOS
82	Hydraulic hand Pump (Emergency Steering)	1	NOS
83	Hydraulic Oil Motor For Outboard Exhaust Flap STBD Side	1	NOS
84	Hydraulic Oil Motor For Outboard Exhaust Flap Port Side	1	NOS
85	**Silicon Oil** Circulation **Accumulator** For Rod Antenna	2	NOS
86	Hydraulic Oil **Motor** For **Radar Turning**	1	NOS
87	Hydraulic Oil **Motor** For Last **Man's Bridge Fin**	1	NOS
88	Hydraulic Oil **Motor** For **Flood Cock Bridge Fin**	1	NOS
89	Hydraulic Oil Hand Pump (Escape Hydraulics)	1	NOS
90	Hydraulic Oil Accumulator For Access Trunk	1	NOS
91	Hydraulic Oil Accumulator For Bulkhead Hydraulic	1	NOS
92	Hydraulic Oil Swing Motor For Emergency Oparation Bulkhead cocks	1	NOS
93	O_2 Cylinder Group	26	NOS
94	Snorkel Mast	1	NOS
95	Hydrazine Cylinders(Fwd)	10	NOS
96	Garbage Ejector	1	NOS
97	HP Air Cylinder (Group 2) at Fwd MBT	6	NOS
98	Hydraulic Oil Accumlator For Tropedo Hydraulic	1	NOS
99	Fwd Maint vent Hyd. Block + Main motors+Drive and Rod gearings including main vent flap	1	NOS
100	Hand Control Slide Valve For Vertical Transport Equipment Torpedos Port Side	1	NOS
101	Hydraulic Oil Motor For Longitudinal Transport Equipment Torpedos	1	NOS
102	Hydraulic Oil Motor For Anchor Windlass	1	NOS
103	Hydraulic Oil Motor For Torpedo Hydraulic	1	NOS
104	Hand Control Slide Valve For Vertical Transport Equipment Torpedos STBD Side	1	NOS
105	HP Air Cylinder (Group 4) at Fwd MBT	6	NOS
106	HP Air Cylinder (Group 3) at Bridge Fin	4	NOS
107	Mine Saddle Hook	4	NOS

7) REMOVAL, FABRICATION, RENEWAL & RE-INSTALLATION OF EXHAUST GAS TRUNKS ALONG WITH VALVE/FLAP (P & S).

Sr. No.	Description of Work/Job	Qty (Nos.)	Unit
1	Removal of Exhaust Gas trunking along with supports and foundation.	49	Nos
2	Removal of change over flap with drive ,outer exhaust valve & inner exhaust valve along with connected fittings and supports.	6	Nos
3	Cleaning/blasting , Thickness gauging and inspection of exhaust trunking after removal.	49	Nos
4	Fabrication of double water jacket pipes, Size – 150 DN - 300 DN including fittings, compensator, brackets and fasteners as per sample as per part list/sample along with materials. Reference Drg. 186/2126-06-00-00	2	Nos
5	Fabrication of other trunking of exhaust system if required as per sample/site along with materials.	20	Nos
6	Re-newel of exhaust compensator	4	Nos
7	Re-newel of Trunking joint Gaskets (Grade – FA4) as per part list/sample.	100	Nos
8	Re-newel of hardware as per sample/part list.	500	Nos
9	Re-installation of new change over flap with drive ,outer exhaust valve & inner exhaust valve supplied by MDL along with connected fittings and supports.	6	Nos
10	Painting and colour coding of Trunking and insulation as required.	49	Nos
11	Re-installation of Exhaust Gas trunking along with supports and foundation after overhauling/fabrication.	49	Nos

8) SCOPE OF WOR –Air conditioning system

SR No	DL No	Position No. of DL.	JOB DESCRIPTION
1	4671	029	Carry out 10000 HOURLY routines on all three A/C system (This includes three (3) pieces seawater pumps attached to motors). Paint the compressor as per specification. Disconnect and remove 3 nos A/C compressor & Motor with all accessories and associated fittings including shock mounts and intermediate foundations. Re-install the same on completion of routine. Condensers (3 nos) .to be disconnected while removing and assembled while re-

			installation. If any modification required while Re-installation to be done by subcontractor. New condenser will be provided by MDL for re-installation. Motor and Compressor is to be aligned after installation.
2	4671	030	Preserve the compressor on completion of routine.
3	4671	031	Remove, Renew and Re-install seven (7) pieces safety valve of Freon circuit and one (1) piece safety valve of chilled water system. Set and check the opening pressure to specified valves. - (i) R 153,154,155 to 20 bar - (ii) R 175,176,177 to 22.5 bar - (iii) R 235 to 4 bar. - Chilled water system
4	~~4671~~	~~032~~	~~Remove, overhaul and Re-install three (3) pieces chopper boxes with accessories and associated items/fittings including shock mounts.~~
5	4671	034	Remove, Renew and Re-install of Chilled water pumps (02 nos) with motor along with all accessories and associated fittings including shock mounts and foundation.
6	4671	035	Remove, Renew and Re-install nine (9) pieces pressure gauges of air conditioning system and seven (7) pieces pressure gauges of Child water circuit. R213,215,217,230,232,197,199,201,111,112,113,109,133,171,108,228, & R231. Calibration certificate required
7	4671	036	Remove, Renew and Re-install three (3) pieces solenoid valves fittings nos.: R 146, 148, and 150 of A/C system.
8	4671	037	Remove, Renew and Re-install twenty-two (22) pieces pressure and temp switches/sensors for control and data logging of A/C system. Fitting nos.: R 181, 182, 183, 190, 192, 193, 194, 195, 196, 206, 208, 209, 210, 211, 212, 221, 223, 224, 225, 226, 227,1158. Calibration certificate required
9	4671	038	Remove, Renew and Re-install three (3) pieces solenoid operated valves (TM 210) fitting nos.: R156, 157, 158 of chilled water system.
10	4671	039	Remove, Renew and Re-install twelve (12) pieces pressure and temp switches/sensors of chilled water system. Fitting nos.: R 129, 130, 159, 160, 161, 164, 165, 169, 173, 168, 167, 166. Calibration certificate required
11	4671	042	Remove, Renew and Re-install chilled water cooler (triple unit-chiller). Carry out pressure test as specified.
13	4671	043	Re-insulate the chilled water cooler (triple unit).

14	4671	044	Renew membrane of chilled water compensating tank.
15	4671	046	Remove, Renew and Re-install forty-five (45) pieces valves of A/C system. R 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 198, 200, 202, 214, 216, 218, 229, 231, 233.
16	4671	047	Remove, Renew and Re-install three (3) pieces driers fitting nos.: R 184, 185, 186 of A/C system.
17	4671	048	Remove, Renew and Re-install six (6) pieces gauge glasses of A/C system. Fitting nos.: R 175, 176, 177, R187, 188, 189.
18	4671	049	Remove, Renew and Re-install twelve (12) pieces mechanical thermometers. Fitting nos.: R 178, 104, 105, 106, 107, 101, 102, 110, 145, 179, 180, 236
18	4671	050	Remove, Renew and Re-install three (3) pieces expansion valves Fitting nos.: R 147, 149, 151
20	4671	053	Remove, Renew and Re-install three (3) pieces line non return valves. Fitting nos.: R 137, 138, 139.
21	4671	054	All sensors to be renewed.
22	4671	055	**SYSTEM PIPING**: Remove/De-braze complete system pipes along with metallic hose pipes from on board to shop floor and ensure proper cleaning of the system as necessary by chemical cleaning / blowing through / drying up with hot air or nitrogen/flushing through.
24	4671	057	Renew all Air conditioning system pipes and Carry out strength test of each individual pipe / group of pipes in on-board /shop for complete system to 1.5 times nominal pressure and to be witness by QA-EY/RMT. Replace pipes found leaking during the test.
24	4671	058	Paint system pipes, valves and fittings as per approved paint scheme.
25	4671	059	Renew all rubber and wooden parts of pipe supports. Renew all steel parts, if required. Three nos local monitoring panel are required to be removed and re-installed after completely renewing piping, fittings, valves and pressure gauges.
26	4671	060	On completion of the system assembly flush / blow through as specified to ensure proper hygiene. Carry out pressure test at working pressure. Rectify leaks, carry out other installation checks as per TM.

			Carry out vacuum test as per TM. Filling/ Charging of Freon gas as per TM. Preservation of plant.
27	4671	061	Carry out tests and trials as per test specifications to the extent applicable. The contractor is to be in stand by for rectification of any defects arising during trials on board and up to period of 18 months after successful trial of AC Plant.

9) SCOPE OF WOR –REFRIGERATION SYSTEM.

SR No	**DL No.**	**Position No. of DL.**	**JOB DESCRIPTION**
1	4700	001	Remove, Renew and Re-install Five (5) pieces pressure gauges and three (3) pieces pressure gauge fitting nos.: S 123, 124, 125 to be renewed.
2	4700	002	Remove, dismantle, clean, overhaul and Re-install Clean and carry out pressure test of evaporators, condensers and receiver of refrigeration plant including associated accessories, shock mounts and int. foundations. Paint as specified. Test pressure for condenser 7.5 bar for two hours. Replace damaged plastic coating. All seals and hardware to be renewed.
3	4700	003	Remove, Renew and Re-install two (2) pieces refrigeration plant compressors (installation along with motor alignment). Paint and preserve compressor on completion of routine along with mounts, foundation, etc.
4	4700	004	Remove, Renew and Re-install Renew fourteen (14) pieces compensators.(12 metallic hose and 2 condenser hose/ bellows).
5	4700	005	Remove, Renew and Re-install two (2) pieces safety Freon valves to components. Certificate of safety valves to be provided , opening pressure to specified valves S115 (20.0 bar) and S137 (22.5 bar).
6	4700	006	Remove, Renew and Re-install eight (8) pieces solenoid operated Freon valves. Fitting nos.: S 102, 101, 103, 110, 112, 227, 228 & 229.
7	4700	007	Remove, Renew and Re-install eight (8) pieces sensors for data logging. Fitting nos.: PT 741, 742, 743, 744, 745, 746, 747, 748.
8	4700	008	Remove, Renew and Re-install two (2) pieces high pressure switches. Fitting nos.: S 118, 119. Calibration certificate required
9	4700	009	Remove, Renew and Re-install one (1) piece suction pressure switch. Fitting no: S 120 Calibration certificate required

10	4700	010	Remove, Renew and Re-install one (1) piece pressure switch for safety valve. Fitting no: S117 Calibration certificate required
11	4700	011	Remove, Renew and Re-install five (5) pieces thermostats . Fitting nos.: 116 (three pieces), 126, 135.
12	4700	012	Remove, Renew and Re-install one (1) piece injection valve. Fitting no: S109
13	4700	013	Remove, Renew and Re-install forty-two (42) pieces system valves of various types Fitting nos.: S 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 116, 130, 131, and 132. N/R Valves 1010, 1016, 1015, 1075, 1077, 1078.
14	4700	014	Remove, Renew and Re-install two (2) pieces oil pressure switches. Fitting nos: S 121, 122.
15	4700	015	Remove, Renew and Re-install three (3) pieces expansion valves. Fitting nos.: S104 to S106
16	4700	016	Remove, Renew and Re-install one (1) piece condenser regulator. Fitting no: S114
17	4700	017	Remove, Renew and Re-install two (2) pieces oil separators.
18	4700	018	Remove, Renew and Re-install three (3) pieces filters. Fitting nos: S1001
19	4700	019	Remove, Renew and Re-install three (3) pieces refrigerator driers. Fitting nos.: S 1009 (two pieces), 1059
20	4700	020	Remove, Renew and Re-install (1) piece drier. Fitting no.: S1008
21	4700	021	Remove, Renew and Re-install five (5) pieces gauge glasses. Fitting nos.: S 1003 (two pieces), 1002 (three pieces)
22	4700	022	Remove, Renew and Re-install two (2) pieces suction pressure controllers. Fitting nos.: S107, 108
23	4700	023	Remove, Renew and Re-install one (1) piece start controller. Fitting no: S113
24	4700	024	Remove, Renew and Re-install one (1) piece capacity controller. Fitting no.: S111
25	4700	025	Remove, Renew and Re-install one (1) piece liquid separator. Fitting no.: S 1007

26	4700	026	Remove, Renew and Re-install three (3) pieces remote thermometers. Fitting nos.: 136 (two pieces), 138
27	4700	027	Remove, Renew and Re-install nine (9) pieces purging valves.
28	4700	028	Remove, Renew and Re-install drainage heating. Fitting no.: S 1058.
29	4700	029	Remove, Renew and Re-install burst plate. Fitting no.: S 1036.
30	4700	030	**SYSTEM PIPING**: Remove/De-braze complete system pipes along with metallic hose pipes from on board to shop floor and ensure proper cleaning of the system as necessary by chemical cleaning / blowing through / drying up with hot air /flushing through.
31	4700	031	Renew all refrigeration system pipes and Carry out strength test of each individual pipe / group of pipes in on-board /shop for complete system to 1.5 times nominal pressure. Replace pipes found leaking during the test.
32	4700	032	Paint system pipes, valves and fittings as per approved paint scheme.
33	4700	033	Renew all rubber parts of pipe supports also renewal of wooden and steel pipe supports if required. Three nos local monitoring panel are required to be removed and re-installed after completely renewing piping, fittings, valves and pressure gauges.
34	4700	034	On completion of the system assembly flush / blow through as specified to ensure proper hygiene. Carry out pressure test at working pressure. Rectify leaks, carry out other installation checks as per TM. Carry out vacuum test as per TM. Filling/ Charging of Refrigerant as per TM. Preservation of plant.
35	4700	035	Carry out tests and trials as per test specification to TS 510-00 to the extent applicable. The contractor is to be in stand by for rectification of any defects arising during trials on-board and up to period of period of 18 months after successful trial of Refrigeration Plant.

10) Weapon Mechanical work

Sr No	System-Equipment	QTY	Unit
1	TORPEDO TUBES-MUZZLE FLAP AND MUZZLE FLAP LINKAGES		

i)	Degutting , of Muzzle flap and its linkages	8	Nos
ii)	Overhauling Muzzle flap and its linkages. All pillow blocks to be renewed and Non- Metallic parts to be renewed. All double pedestal and Eye bearings to be Renewed. All Non- Metallic parts to be renewed.	8	Nos
iii)	Re-Installation of Muzzle flap and its linkages. Chalk testing and 2-4 mm gap to be maintained.	8	Nos
2	TORPEDO TUBES-BREECH DOOR		
i)	Degutting of breech door.	8	Nos
ii)	Overhauling of breech door. All Non- Metallic parts to be renewed.	8	Nos
iii)	Re-Installation of Breech door. All Non-Metallic parts to be renewed. Chalk testing to be done.	8	Nos
3	TORPEDO TUBES-HOLDING DEVICE AND HOLDING JACK		
i)	Degutting of holding jack and holding device.	8	Nos
ii)	Renewal of holding jack and holding device. All Non-metallic parts to be renewed	8	Nos
iii)	Installation of holding jack and holding device. All Non-metallic parts to be renewed. The cut-off device should operate at 25 NM.	8	Nos
4	TORPEDO TUBES-INTERLOCKING LINKAGE AND DRIVE FOR F&D Valve		
i)	Degutting of all interlock linkages and Drive for F&D valves.	8	Nos
ii)	Overhaul of all interlock linkages and Drive for F&D valves.ll Non-metallic parts to be renewed.	8	Nos
iii)	Installation of all interlock linkages and Drive for F&D valves. All Non-metallic parts to be renewed.	8	Nos
5	TORPEDO TUBES-INTERLOCKING BEARING		
i)	Degutting of INTERLOCK BEARING , CUT-OFF DEVICE, 2/2-WAY LIMIT SWITCH, BLIND FLANGE	8	Nos
ii)	Overhaul of INTERLOCK BEARING , CUT-OFF DEVICE, 2/2-WAY LIMIT SWITCH, BLIND FLANGE. All Non-metallic parts to be renewed.	8	Nos
iii)	Installation of INTERLOCK BEARING , CUT-OFF DEVICE, 2/2-WAY LIMIT SWITCH, BLIND FLANGE . All Non-metallic parts to be renewed.	8	Nos
6	TORPEDO TUBES-GEAR WITH MOTOR AND INDICATOR		
i)	Degutting of Gear and Motor with Indicator.	8	Nos

ii)	Renew of Gear and Motor with Indicator. All Non-metallic parts to be renewed	8	Nos
iii)	Installation of Gear and Motor with Indicator. All Non-metallic parts to be renewed.	8	Nos
7	TORPEDO TUBES-SCREW DRIVE , SLIDING CARRIAGE AND STOP		
i)	Degutting of SCREW DRIVE , SLIDING CARRIAGE AND STOP	8	Nos
ii)	Renew of SCREW DRIVE AND STOP. Overhauling of SLIDING CARRIAGE. All Non-metallic parts to be renewed.	8	Nos
iii)	Installation of SCREW DRIVE , SLIDING CARRIAGE AND STOP . All Non-metallic parts to be renewed.	8	Nos
8	TORPEDO TUBES-SACRIFICAL ANODE FOR ALL TLT TUBES		
i)	Degutting of Sacrificial anodes.	1	Set
ii)	Renew of Sacrificial anodes.	1	Set
iii)	Installation of Sacrificial anodes.	1	Set
9	TORPEDO TUBES-LINKAGE FOR SHELL FLAP TLT 1-8		
i)	Degutting of LINKAGE FOR SHELL FLAP 1-8	1	Set
ii)	Overhaul of LINKAGE FOR SHELL FLAP 1-8. All Non-metallic parts to be renewed.	1	Set
iii)	Installation of LINKAGE FOR SHELL FLAP 1-8 . All Non-metallic parts to be renewed.	1	Set
10	TORPEDO TUBES-SHELL FLAPS AND BEARING FOR SHELL FLAPS		
i)	Degutting SHELL FLAPS AND BEARING FOR SHELL FLAPS.	8	Nos
ii)	Overhaul BEARING FOR SHELL FLAPS. ALL SHELL FLAPS TO BE RENEWED. All Non-metallic parts to be renewed.	8	Nos
iii)	Installation of SHELL FLAPS AND BEARING FOR SHELL FLAPS . All Non-metallic parts to be renewed.	8	Nos
11	TORPEDO TUBES-GUIDE RAIL (TLT tubes inside and Forebody)		
i)	Degutting Guide rails / HOSTALINE inside TLT tubes and Forebody.	8	Sets
ii)	Renewal of Guide rails / HOSTALINE inside TLT tubes and Forebody. All studs to be inspected before installation of guide rails if found damage , to be renewed.	9	Sets

iii)	Installation of Guide rails / HOSTALINE inside TLT tubes and Forebody. Alignment to be done with cross jig Drawg : 188-0873-09-00-00.	10	Sets
12	-STW and Inspection of Torpedo tubes by CINA	Not applicable	
i)	Pressure testing , STW and Test and trails of the equipment of TLT tubes and Forebody are to be carried out as per the CINA checks.		
13	TORPEDO LOADING-Loading Platform		
i)	Overhauling and Load testing of Loading platform. All Non-metallic parts to be renewed. Renewal of guard rail along with rope , tackle and Ladder.	1	No
14	TORPEDO LOADING-Transfer Car		
i)	Overhauling of Transfer car. All rollers to be renew. All Non-metallic parts to be renewed.	1	No
15	TORPEDO LOADING-Retractable retaining bolts		
i)	Degutting of Retractable retaining bolts	2	Nos
ii)	Renewal of Retractable retaining bolts.	2	Nos
iii)	.Installation of Retractable retaining bolts. The protruded portion of the bolts outside forebody to be covered with hostalin caps.	2	Nos
16	TORPEDO HANDLING SYSTEM-Lifting Transverse		
i)	Degutting of Lifting Transverse.	2	Nos
ii)	Overhauling of Lifting Transverse. All Non-metallic parts to be renewed.	2	Nos
iii)	Installation of Lifting Transverse. All Rollers to be renewed. All Non-metallic parts to be renewed.	2	Nos
17	TORPEDO HANDLING SYSTEM-Lifting Mast(Fore and AFT)		
i)	Degutting of Lifting Mast (Fore and AFT).	1	No
ii)	Overhauling of Lifting Mast (Fore and AFT).All Non-metallic parts to be renewed.	1	No
iii)	Installation of Lifting Mast (Fore and AFT). All Non-metallic parts to be renewed.	1	No
18	TORPEDO HANDLING SYSTEM-Lifting Tackle		
i)	Degutting of Lifting Tackle.	1	No
ii)	Overhaul of Lifting Tackle. All Rollers / Pulleys/ Springs/ Ropes and slings to be renewed. All Non-metallic parts to be renewed.	1	No

iii)	Installation of Lifting Tackle. . All Non-metallic parts to be renewed.	1	No
19	TORPEDO HANDLING SYSTEM-Transverse Transfer Car and Oil connection for Tranverse trasfer		
i)	Degutting of Lifting Tackle	4	Nos
ii)	Overhaulling of Lifting Tackle o. All Rollers / Pulleys/ Springs / hoses to be renewed. All Non-metallic parts to be renewed. Oil drums to be overhualed.	4	Nos
iii)	Installation of Lifting Tackle and Oil connection for Tranverse trasfer.	4	Nos
20	TORPEDO HANDLING SYSTEM-Guide Rail		
i)	Degutting of Guide Rail.	2	Nos
ii)	Overhaul of Guide Rail . All Rollers / Pulleys/ Springs / gears to be renewed. All Non-metallic parts to be renewed.	2	Nos
iii)	Installation of Guide Rail.	2	Nos
21	TORPEDO HANDLING SYSTEM-Longitudinal Transfer Car		
i)	Degutting of Longitudinal Transfer Car	1	No
ii)	Overhauling of Longitudinal Transfer Car. All Rollers / Pulleys/ Springs / gears to be renewed. All Non-metallic parts to be renewed.	1	No
iii)	Installation of Longitudinal Transfer Car .	1	No
22	TORPEDO HANDLING SYSTEM-Lengthening Rod, Coupling piece for Longitudinal transport, Roller for Longitudinal transfer		
i)	Overhauling of Lengthening Rod, Coupling piece for Longitudinal transport, Roller for Longitudinal transfer. All Rollers / Pulleys/ Springs / gears to be renewed. All Non-metallic parts to be renewed.	1	No
23	TORPEDO STOWAGE SYSTEM-Tension Belt, Transport belt and Tension Belt wire Dispenser		
i)	Degutting of Tension Belt, Transport belt and Tension Belt wire Dispenser.	24	Nos
ii)	Overhauling of Tension Belt, Transport belt and Tension Belt wire Dispenser. All hostaline and rivets to be renewed.TECHNICOLL 8053 Pasting solution to be used to paste the hostaline parts on Belts. All Non-metallic parts to be renewed.	24	Nos
iii)	Installation of Tension Belt, Transport belt and Tension Belt wire Dispenser .	24	Nos

24	TORPEDO STOWAGE SYSTEM-Torpedo reserve stowage with transverse and Locking equipment		
i)	Degutting of Torpedo reserve stowage with transverse and Locking equipment	1	No
ii)	Overhauling of Torpedo reserve stowage with transverse and Locking equipment	1	No
iii)	Installation of Torpedo reserve stowage with transverse and Locking equipment .all shock mounts to be renewed. All Non-metallic parts to be renewed.	1	No
iv)	Load testing of Torpedo stowage and Handling system.	1	No
v)	STW of Torpedo stowage and Handling system as per TM 702.	1	No
25	HOISTABLE MAST- 2-Stage Transceiver antenna mast		
i)	Degutting of 2-Stage Transceiver antenna mast.	1	No
ii)	Installation of 2-Stage Transceiver antenna mast. Silicon Oil CR_100 to be filled in the accumulator and mast and maintain the pressure values as per the TM-505.	1	No
26	HOISTABLE MAST-ESM mast		
i)	Degutting of ESM mast and Cable guide.	1	No
ii)	Overhualing of Cable guide. All GRP , Non-Metallic parts and Hardware to be renewed.	1	No
iii)	Installation of ESM mast and PHP tightness test with nitrogen as per TM 505.	1	No
27	HOISTABLE MAST-Attack periscope		
i)	Degutting of Attack Periscope.	1	No
ii)	Installation of Attack Periscope and PHP tightness test with nitrogen as per TM 505.	1	No
28	HOISTABLE MAST-Search Periscope Mast		
i)	Degutting of Search periscope.	1	No
ii)	Installation of Search periscope and PHP tightness test with nitrogen as per TM 505.	1	No
29	HOISTABLE MAST-Radar Mast		
i)	Degutting of Radar Mast.	1	No
ii)	Installation of Radar Mast and PHP tightness test with nitrogen as per TM 505.	1	No
30	-CHA		
i)	Degutting of CHA.	1	No
ii)	Installation of CHA.	1	No
31	-CTA		
i)	Degutting of CTA.	1	No
ii)	Installation of CTA.	1	No

32	-CIA		
i)	Degutting of CIA.	1	No
ii)	Installation of CIA.	1	No
33	-VLF		
i)	Degutting of CIA.	1	No
ii)	Installation of CIA.	1	No
34	-FLANK ARRAY (PORT AND STBD)		
i)	Degutting of FLANK ARRAY (PORT AND STBD)	1	No
ii)	Installation of FLANK ARRAY (PORT AND STBD)	1	No
35	-DISTRESS BUOY		
i)	Degutting of Distress buoy and Wire stowage reel.	1	No
ii)	Overhualing of Wire stowage reel assembly .	1	No
iii)	Installation of Distress buoy and Wire stowage reel.	1	No
36	-BATTERY HOOK RAILS (AFT AND FWD)		
i)	Degutting of BATTERY HOOK RAILS (AFT AND FWD).	2	Sets
ii)	Overhualing of BATTERY HOOK RAILS (AFT AND FWD). Renew all hostaline materials and Hardware.	2	Sets
iii)	Installation of BATTERY HOOK RAILS (AFT AND FWD).	2	Sets

11) Hull Doubler Valves

Sr. No.	DN -HULL VALVE	QTY IN NOS.
1	6	17
2	8	4
3	10	6
4	15	6
5	16	3
6	20	10
7	25	7
8	32	3
9	40	1
10	50	10
11	80	13

12	100	12
13	150	4
14	250	2
	Total	98

Annexure - F

SCOPE OF WORK

WEAPON MECHANICAL EQUIPMENTS MRLC-2

1. BRIEF WORK CONTENT

The scope of work is not only limited to removal and refitting of Weapon mechanical equipment's of INS-Shankush, but also as detailed in subsequent paragraphs. The successful contractor is required to prepare and furnish "Daily Progress Report" as per the format decided by the User (Weapon-Mechanical executive of Section)/ Ship Manager- MRLC.

3. WORK PROGRESS MONITORING AND REPORTING:

3.1 Subcontractor has to prepare detailed overall plan indicating the schedule of work activities in consultation with OIC (L & Wn-EY-MRLC)/designated Executive and submit the same to MDL on weekly basis. Subcontractor's reps. have to meet the designated production officer(s) of Weapon dept. with the starting of MDL working time and discuss about the work plans which are going to be executed for the day and the follow-up reports about progress of works have to be prepared within the same working day.

3.2 Daily Work Progress Report is to be rendered by the subcontractor latest by the next working day.

4. SUBCONTRACTOR'S DETAILED SCOPE OF WORK/ SUPPLY

4.1 General

4.1.1 Subcontractor has to take custody of all the required Work Instructions, drawings, wiring plan of systems etc, store them properly and return them to MDL in good condition after completion of job.

4.1.3 The Subcontractor should thoroughly check onboard equipment's as per the drawing/ Part list and properly label each and every part before degutting any equipment. If any shortage/ Damage found, immediately intimate MDL with proper letter before beginning of the equipment degutting.

4.1.3 The subcontractor should preserve the equipment's / parts after degutting by applying the proper preservative materials.

4.1.4 The subcontractor should clean the equipment's and do minor repairs before offering opening inspection to the MDL and SRMT.

4.1.4 The subcontractor should replace all grades of hardware <= 8.8 and all type of materials of size <= M8.

4.1.5 All the hardware, loose parts etc. removed from the equipment should be preserved/ stored properly by the firm and the same will be required at the time of installation. Cost of any parts or hardware lost/ damaged will be recovered from the subcontractor's bill. Before installation, these materials are to be offered to MDL and SRMT. It is the subcontractor's responsibility to replace the material if found unsatisfactory.

4.1.6 The subcontractor should replace all Non – Metallic parts of the equipment's, Springs and Gears and installation spares.

4.1.7 The subcontractor should carry out the overhauling, installation and STW as per the documents provided by MDL-design department.

4.1.8 The Subcontractor should carryout blue matching, machining, drilling, gas cutting, grinding, welding and NDT activities as per the requirement during degutting, overhauling and installation activities.

4.1.9 The subcontractor should offer Opening inspection, Overhauling inspection, Assembly inspection stage by stage to MDL and SRMT.

4.1.10 The subcontractor should replace the parts as per the opening inspection report.

4.1.11 All the materials which are to be renewed are under subcontractor's scope.

4.1.12 The subcontractor should approach to MDL, if any painting requirements during overhauling and installation.

4.1.13 The assembly after installation should function to the satisfaction of MDL-QA and the Naval Authorities for which they will conduct Tests and Trials as per specifications. Work completion certificates of the TLT tube and Forebody equipment's will be issued after successful completion of CINA checks.

4.1.14 Jobs carried out by the subcontractor, if found defective/ unsatisfactory during the trials, will have to be rectified by the subcontractor free of charge.

4.1.15 The firm should handle all equipment with utmost care and cost of any damage to the equipment caused by the firm will be recovered.

4.1.9 Work progress report is to be prepared by the sub-contractor and to be submitted to the designated production executive of Weapon department on daily basis.

Annexure -G: SOW FOR SHAFTING AND STEERING

A) SHAFTING

Sr no	Brief Description	Scope of Work
1	Propeller and Propeller cone	Ref TM: 203 Ref Assembly Drawing: 186/2511-02-00-00, 186/2611-01-00-00,186/2511-02-10-00,186/2511-02-12-00 Job Content: 1) Remove Propeller and Propeller cone 2) Cleaning and Visual Inspection of Propeller and Propeller cone and All removed parts. 3) Carryout crack detection of Propeller and Propeller cone using DP method, Repair if cracks are detected 4) Carryout static balancing and profile check of propeller in shop (if visually found damaged) 5) Renew zinc filling, Cement, Pastolite and Tallo on propeller cone as referred in assembly drawing. 6) All spare, hardware, consumable, Shim to be renewed/Overhaul as mentioned TM, Assembly drawing and Inspection report 7) Install the Propeller and Propeller cone as per TM, assembly drawing. 8) All the spare, hardware, consumable, Shim, Zinc, Cement, Pastolite and Tallo to be provide by Sub-Contractor. 9) Propeller and Propeller cone mounting special tools like Jack, Hydraulic pump, hoses etc to be arranged by Sub-contractor (Note - Incase of renewal propeller & propeller cone will be provided by MDL) 10)Special tool (Spanner) for propeller nut tighting will be provided by MDL, balance tools to be arranged by Sub contractor.
2	Propeller Shaft and Poker gauge	Ref TM: 203 Ref Assembly Drawing :186/2511-02-00-00,186/2511-02-10-00,186/2511-02-14-00 Job Content: 1) Remove the Propeller shaft from on-board 2) Check propeller shaft's exposed area for cracks by DP Test. Check the trueness and roundness of the shaft. Inspect the condition of shaft sleeves. 3) Cello Flex coating of the propeller shaft to be renewed. 4) Install propeller shaft upon completion of routines and record stern tube bearings (Aft and Fwd) clearances. 5) Poker Gauge: Remove, Inspect, Overhaul, renew all the spare as per ref drawing. 6) All the spare, hardware, cello flex , consumable to be provide by Sub-Contractor. 7) Shaft Insertion tool, trolley and track will be provide by MDL. Balance tooling under Sub-Contractor scope.
3	Stern tube Bearing 02 nos	Ref TM: 203 Ref Assembly Drawing :186/2511-02-00-00,186/2511-01-16-00,186/2511-02-15-01,186/2511-02-18-00 Job Content: 1)Remove the Stern tube Bearing 02 nos and carry out visual inspection. 2) Renew all phenolic resin bearing strips. Machine the resins according to propeller shaft sleeve. 3) Grind, clad weld and machine of corroded areas of bearing housing if required. 4)Inspect the penetration of bearing (02nos) , repair if required 5) Installation the bearing. Measure the stern tube clearances after position of Propeller shaft. During installation of bearing renew all the spare for installation. 6) Remove 02 nos zinc sacrificial ring mounted on the stern tube bearing, Renew the 02 nos zinc sacrificial ring. Re-install the new zinc ring onboard, Renew all the spare and consumable during installation. 7) All the spare, hardware, consumable, phenolic resin, Zinc ring to be provide by Sub-Contractor 8)The bearing mounting tool threaded rod, flange will be provided by MDL, balance tool to be arranged by sub-contrator.
4	Stern Gland	Ref TM: 203

		Job Content: 1)Remove the stern gland from on board 2) Open the stern gland carry out the survey/Inspection and Overhaul. 3) Renew the part as per the survey report 4) Re-install the stern gland as per TM/ Drawing and carry out pressure test. 5) All the spare, hardware, consumable, renew parts as per survey report to be provide by Sub-Contractor 6) Preservation according to TM
5	Flange coupling and Intermediate shaft (Split Shaft)	Ref TM:203 Ref Assembly Drawing :186/2511-02-00-00,186/2543-01-00-01,186/2511-02-00-04 Job Content: 1)Remove the Flange coupling and Intermediate shaft (Split Shaft) and carry out the survey/Inspection, Overhaul 2) Renew the fit bolt (10 nos) between Flange coupling and Intermediate shaft (Split Shaft) 3) Mount the flange coupling and Split shaft onboard according to TM. 4) Align the Flange coupling and Intermediate shaft (Split Shaft) and Reaming of 10 nos hole for mounting fitbolt. 5) Fit bolt to be machined according to reamed hole 6) Fit bolt to mounted onboard according to TM/Drawing. 7) All the spare, hardware, consumable, renew parts as per survey report to be provide by Sub-Contractor 8) Preservation according to TM 9) Flange mounting jack will be provided by MDL, balance tool to be arranged by sub-contractor.
6	Thrust Bearing (Thrust Block)	Ref TM:203 Ref Assembly Drawing :186/2513-01-00-00 Job Content: 1) Remove, Disassemble thrust bearing for inspection. 2) Check the axial clearance of thrust pad and Radial clearance of thrust bearing shafts. Note: Dye Penetration check thrust pads, bearing shells and thrust shafts. Work to be done under instruction of the OEM specialist. 3) Renew the part as per internal inspection 4) Remove the flanged tube cooler for Chemically cleaning and pressure test (50 bar) and re-install. 5) Remove, Renew the fitbolt (20 nos) mounted on the thrust block shaft. Align the thrust block with split shaft and hollow spring coupling. Reaming of flange accordingly. 6) Machine the fitbolt accordingly reamed hole and mount on-board as per assembly drawing. 7) Mount the Thrust block according to installation drawing. 8) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor
7	Hollow spring coupling	Ref TM:203 Ref Assembly Drawing :186/2544-02-00-00 Job Content: 1)Dismantle hollow spring coupling to components including primary and secondary disc. 2)Inspect all part and carry out overhaul. 3) Ten (10) pieces rubber hollow spring and forty (40) pieces of bushes to be renewed under MDL. 4)Renew all the part as per inspection report. 5)Re install the hollow spring coupling after alignment of primary and secondary disc of hollow spring coupling. 6) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor

8	Main propulsion motor	Ref TM:300 Ref Assembly Drawing :186/2552-01-00-00 Job Content: 1)Dismantle the foundation of main propulsion motor, Remove the main motor from the submarine. 2)Dismantle two (2) pieces main motor bearings. Inspect and carry out overhaul. Renew parts as required. Renew oil rings. 3)Remove, Inspect, Overhaul shock mounts (Rubber elements & spring elements will be provided by MDL) & Re-install. 4)Remove cooler (02nos), Install new coolers supplied by tkMS. Renew installation fasteners & seal kits. 5)Remove the cooling fan (04nos) of main motor. Manufacture wooden boxes for shipment to OEM for overhaul, Install cooling fans overhauled by OEM . Renew installation fasteners & seal kits. 6) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor
9	Shaft Turning Device	Ref TM:203 Ref Assembly Drawing :186/2552-01-00-00 and 72135/MISC-TM Job Content: 1)Remove shaft turning device 2) Carryout the Inspection of housing and accessories 3)Shaft turning device to be renewed. Overhaul Housing and renew Air motor and gearbox. 4) Carry out required modification to the foundation of shaft turning device. 5)Prepare assembly of turning motor and install onboard as per drawing reference. 6) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor
10	Shaft Brake	Ref TM:203 Ref Assembly Drawing :186/2514-01-00-00 Job Content: 1)Remove shaft Brake 2) Dismantle and Carryout the Inspection of Shaft Brake 3)Renew/Overhaul the all the spare part as per inspection report 5)Assembly of shaft brake and install onboard as per drawing reference. 6) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor
11	Shafting Trials	Carry out tests and trials of shafting and its fitting as per below mentioned test specifications to the extent applicable. - TS 224 – 01 Shaft and Stern tube, - TS 224 – 02 Thrust bearing, - TS 224 – 03 Stern tube seal, - TS 224 – 04 Hollow Spring Coupling,

B) AFT HYDROPLANE

Sr no	Brief Description	Scope of Work
1	Aft Hydroplane Blade , Shaft, Lever, Counter weight and Bearing	Ref TM: 401 Ref Assembly Drawing: 186/4121-02-00-00,186/4121-03-00-00 Job Content: 1) Remove Aft Hydroplane Blade (02nos), Shaft, Lever, Counter weight, and seal kit (stuffing box) 2) Carry out general overhaul and conservation of the aft plane bearings as per TM. Record clearances / measurements as per TM reference with special emphasis on the measured clearance at bearing points between stock and bushes. If required remove the bearing. 3) Cleaning and Inspection of all removed parts 4) Install new port and STBD aft hydroplane blade supplied by MDL. 5) Renew all the spare part, consumable, Bearing (Deva Bush) as per the inspection report 6)Inspection of penetration on Main ballast tank before mounting of bearing (Deva Bush). 7) Machine the deva bush and Fit on board (Dry ice fitment) If required as per inspection report. 8)Mount the aft Hydroplane shaft and fit the seal kit (Port/STBD) special emphasis on distance ring 9) Before mounting the hydroplane blade, perform leak test of stuffing box glands (Seal kit) using

		air at 0.6 bars. 10) After confirmed pressure report mount the Aft Hydroplane Blade. 11) After overhaul mount counter weight (02nos) and Lever on aft hydroplane shaft with anode fitment as per drawing. 12) All the assembly of part as per the assembly drawing. 13) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor 14)Special tool (Spanner) for torque tighting of aft hydroplane blade will be provide by MDL. Balance tools arrange by Sub-contractor.
2	Aft Hydroplane Linkage	Ref TM: 401 Ref Assembly Drawing: 186/4126-01-00-00 Job Content: 1) Dismantle and remove, carry out inspection and overhaul of the aft hydroplane plane linkage. 2) Carry out inner and outer conservation by cleaning and sound insulation on linkage. Carry out Anode fitment on linkage. 3)Renew the spherical bearings (in total two (2) pieces). 4)Renew/Overhaul the spare part as per the inspection report 5) Mount the linkage onboard, All the assembly of part as per the assembly drawing. 6) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor.
3	Aft Hydroplane Drive	Ref TM: 409 Ref Assembly Drawing: 186/4127-01-00-00,72172/4174-09-00-00,72172/4174-08-00-09 Job Content: 1) Dismantle and remove hydraulic drive, Cross head, Cross head guide /Rod and RPT on drive 2)Carry out overhaul and inspection of all part Hydraulic drive to be removed , overhauled & tested with proportionate control block. Travel time under load to be demonstrated at workshop. Machining of Drive Rod, Honing of cylinders , Dechroming , chrome plating and accordingly manufacturing of new seals to be undertaken (2 Sets of Spare seals to be supplied) New Proportionate control valve blocks supplied by MDL to be fitted. Lanterns to be overhauled. 3) One number pressure hull penetration of Aft hydroplane drive to be checked. Inspection report to be submitted. If required, Repair by local build up and grinding the pressure hull penetration one (01) number of aft hydroplane drive as per TM. 4)Mount the crosshead guide and carry out pressure test 5) Mount the hydraulic drive and cross head carry out fitment 6)Renew/Overhaul the spare part as per the inspection report 7) All the assembly of part as per the assembly drawing. 8) Dismantle one pieces planes angle transmitters, electrical position indications and other control electronics.Hand over to OEM for overhaul. Installation after overhaul. Renew installation fasteners. 9) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor.
4	Aft Hydroplane Trial	Carry out trials as per applicable test specification

c) RUDDER

Sr no	Brief Description	Scope of Work

1	Rudder Blade , Upper Rudder Shaft, U-shaft, Lower Rudder shaft and Bearing (Deva Bush)	Ref TM: 401 Ref Assembly Drawing: 186/4123-03-00-00,186/4121-03-00-00 Job Content: 1) Remove Rudder Blade (02nos), Shaft (Upper/Lower) ,U-shaft , and seal kit 2) Carry out general overhaul and conservation of the Rudder bearings as per TM. Record clearances / measurements as per TM reference with special emphasis on the measured clearance at bearing points between stock and bushes. 3) Cleaning and Inspection of all removed parts 4) Renew Bearing (Deva Bush) 5) Install new Upper/Lower Rudder blade supplied by MDL/Subcontractor??, 6)Renew all the spare part, consumable as per the inspection report 7)Inspection of penetration on Main ballast tank before mounting of bearing (Deva Bush). 8) Machine the deva bush and Fit on board (Dry ice fitment) 9)Mount the Upper/Lower Rudder shaft, U-shaft and fit the seal kit (Port/STBD) special emphasis on distance ring 10) Before mounting the Rudder blade, perform leak test of stuffing box glands (Seal kit) using air at 0.6 bars. 11) After confirmed pressure report mount the Rudder Blade. 12) All the assembly of part as per the assembly drawing. 13) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor 14)Special tool (Spanner) for torque tighting of Rudder blade will be provide by MDL. Balance tools arrange by Sub-contractor.
2	Rudder Linkage	Ref TM: 401 Ref Assembly Drawing: 186/4125-01-00-00 Job Content: 1) Dismantle and remove, carry out inspection and overhaul of the Rudder linkage. 2) Carry out inner and outer conservation by cleaning and sound insulation on linkage. Carry out Anode fitment on linkage. 3)Renew the spherical bearings (in total two (2) pieces). 4)Renew/Overhaul the spare part as per the inspection report 5) Mount the linkage onboard, All the assembly of part as per the assembly drawing. 6) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor.
3	Rudder Drive	Ref TM: 409 Ref Assembly Drawing: 186/4129-01-00-00 ,72172/4174-10-00-00,72172/4174-08-00-09 Job Content: 1) Dismantle and remove hydraulic drive, Cross head, Cross head guide /Rod and RPT on drive 2)Carry out overhaul and inspection of all part Hydraulic drive to be removed, overhauled & tested with proportionate control block. Travel time under load to be demonstrated at workshop. Machining of Drive Rod, Honing of cylinders, Dechroming , chrome plating and accordingly manufacturing of new seals to be undertaken (2 Sets of Spare seals to be supplied) New Proportionate control valve blocks supplied by MDL to be fitted. Lanterns to be overhauled. 3)One number pressure hull penetration of Rudder drive to be checked. Inspection report to be submitted. If required, Repair by local build up and grinding the pressure hull penetration one (01) number of Rudder drive as per TM. 4)Mount the crosshead guide and carry out pressure test 5)Mount the hydraulic drive and cross head carry out fitment 6)Renew/Overhaul the spare part as per the inspection report 7) All the assembly of part as per the assembly drawing. 8) Dismantle one pieces planes angle transmitters, electrical position indications and other control electronics. Hand over to OEM for overhaul. Installation after overhaul. Renew installation fasteners. 9) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor.

4	Rudder Trial	Carry out trials as per applicable test specification

D)FORWARD HYDROPLANE

Sr no	Brief Description	Scope of Work
1	Forward hydroplane Blade (02 nos) , Shaft (02 nos), Bearing with Bearing Bracket (04nos) and Leaver (02nos)	Ref TM: 401 Ref Assembly Drawing: 186/4122-03-00-00 Job Content: 1) Remove Forward Hydroplane Blade (P/S) (02nos), Shaft (P/S) 02 nos ,Bearing with Bearing Bracket (04nos) and Lever (02 nos) 2) Cleaning and Inspection of all removed parts 3) Carry out the general overhaul of the fore plane blades (as per hull routines) and carry out inner and outer conservation of the blades. New forward hydroplane optional In case of renewal option, the same would be undertaken within SoW. 4)Renew Spherical Bearing (04 nos) 5)Renew all the spare part, consumable, Shim and Fit bolt as per inspection report. 6)Fit the Spherical bearing in bearing bracket by Heating 7)Mount the Port/STBD shaft, Blade and Bearing Bracket and lever with Anode fitment 8) Carry out the general overhaul of the fore plane bearings and their conservation. Record clearance / measurements as per TM reference with special emphasis on the following: - (i) between stock and joint bearings - (ii) between fitting half sheave and lever (port & stbd) 9) All the assembly of part as per the assembly drawing. 10) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor 11)Special tool (Spanner) for torque tighting of Forward Hydroplane blade will be provide by MDL. Balance tools arrange by Sub-contractor.
2	Forward Hydroplane Linkage (02 nos)	Ref TM: 401 Ref Assembly Drawing: 186/4126-02-00-00 Job Content: 1) Dismantle and remove, carry out inspection and overhaul of the forward hydroplane linkage (02nos). 2) Carry out inner and outer conservation by cleaning and sound insulation on linkage. Anode fitment on linkage. 3)Renew the spherical bearings (in total two (2) pieces). 4)Renew/Overhaul the spare part as per the inspection report 5)Mount the linkage onboard, All the assembly of part as per the assembly drawing. 6) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor.
3	Forward Hydroplane Drive (02nos)	Ref TM: 409 Ref Assembly Drawing: 186/4128-01-00-00 ,72172/4174-08-00-00,72172/4174-08-00-09 Job Content: 1) Dismantle and remove hydraulic drive, Cross head, Cross head guide /Rod and RPT on drive 2)Carry out overhaul and inspection of all part Hydraulic drive to be removed, overhauled & tested with proportionate control block. Travel time under load to be demonstrated at workshop. Machining of Drive Rod, honing of cylinders, Dechroming, chrome plating and accordingly manufacturing of new seals to be undertaken (2 Sets of Spare seals to be supplied) New Proportionate control valve blocks supplied by MDL to be fitted. Lanterns to be overhauled. 3 Two number pressure hull penetration of Forward hydroplane drive to be checked. Inspection report to be submitted. If required, Repair by local build up and grinding the pressure hull penetration two (02) number of forward hydroplane drive as per TM.

		4)Mount the crosshead guide (02nos) and carry out pressure test 5)Mount the hydraulic drive and cross head carry out fitment 6)Renew/Overhaul the spare part as per the inspection report 7) All the assembly of part as per the assembly drawing. 8) Dismantle one pieces planes angle transmitters, electrical position indications and other control electronics. Hand over to OEM for overhaul. Installation after overhaul. Renew installation fasteners. 9) All the spare, hardware, consumable, renew parts as per inspection report to be provide by Sub-Contractor.
4	Forward Hydroplane Trial	Carry out trials as per applicable test specification

Annexure H : SOW for Hull Equipment Installation

1. MDL SCOPE:

1.1 MDL will provide only space, Water and source compressed air (service air) supply of 4 -7 bars pressure & electricity and electrical connections.

1.2 Crane facilities for lifting heavy materials (>50 kg) will be provided by MDL, as per requirement, taking safety and weight factors into consideration. contractor has to give 24-hour prior intimation

1.3 Power supply - 440 Volts, 220 Volts & 110 Volts for tools and equipment/ instruments, 110 Volts for electrical grinding/ drilling machines/ lighting arrangement and 24 Volts for temporary hand-held lighting arrangement.

1.4 Suitable space/work site within MDL, if available, for the subcontractor's office and space for keeping lockable storage, cabinets for instruments and storing material.

1.5 MDL EY-Design will provide latest version of drawings, specifications, formats and other documents. Contractor needs to take into consideration the changes from earlier version and immediately inform MDL about any problems noted.

1.6 Staging material will be provided by MDL.

1.7 Any welding with HY-80 material will be in MDL scope.

1.8 Blasting and painting of external surfaces as per paint Specification to be done by the MDL.

1.9 Assistance in arrangement of gate passes.

1.10 Firm's performance will be reviewed by MDL after every months of placement of order and if found unsatisfactory, MDL reserves the right to short close the order and divert the jobs to other performing contractor

2. SUBCONTRACTOR'S SCOPE

2.1 Sub-contractor has to carryout entire work at MDL premises as per rule and regulation applicable at MDL.

2.2 All material /cut parts will be in subcontractor's scope along with test certificate as per specification and drawings.

2.3 The welding instructions/procedure/sequence of operation and inspection details as laid down in the Drawing /QA requirement should be strictly adhered to WPS and PQR for welding in subcontractor's scope.

2.4 Preheating and welding of SBST/LN44 material wherever required is be arranged by subcontractor.

2.5 Preservative (primer) for preservation of all weld joints after NDT (if required) are in subcontractor's scope.

2.6 **Material:** Welding electrodes (as per attached list below), consumables, fasteners, hardwares, anodes as per listed drawings and part list are in subcontractor's scope. Subcontractor should submit test certificates, relevant documents of all material as per specification given in drawing. Subcontractor should offer material for inspection as per QAP to EY-QA and SRMT.

SR NO	MATERIAL DESCRIPTION	ELECTRODE SIZE
1	Supratherme (Spl)	2.5 mm
2	Supratherme (Spl)	3.15 mm
3	Supratherme (Spl)	4 mm
4	Grinox 514	2.5 mm
5	Grinox 514	3.2 mm
6	Thermanit X	2.5 mm
7	Fox AM 400	3.2 mm
8	FOX AM 400	4 mm
9	Thermanit 19/15	3.2 mm
10	Arrosta 4462	2.5 mm
11	Arrosta 4462	3.2 mm
12	Filler Wire Grinox TR4E	2 mm
13	Filler Wire Themanit 20/16	2 mm
14	Filler Wire Arrosta	3.2 mm
15	FOX CN 13/4 Supra	3.2 mm
16	Super Stainless	3.2 mm

2.7 Material Acceptance: Prior to commencement of work subcontractor to submit material test certificate from NABL authorized. Lab & OEM certification if any with CC. Mdl clearance /approval to be obtained for confirmation of the material specification.

2.8 All material and consumables required for fabrication of tools, Skids, Jigs & Fixtures, Template / wooden templates/ mock-ups etc are in subcontractor's scope. Material for the skids, Jigs & Fixtures is to be of IS 2062

2.9 Scaffolding and temporary supports inside and outside submarine wherever required will be in subcontractor's scope.

2.10 **Machines and equipment** : Duly calibrated inverter based welding machines with rectifiers, Baking ovens, Portable ovens required for handling the electrodes (usage of ovens with asbestos cloth inside is not permitted), Edge bevelling and machining facility/ machine, Drilling & tapping machines, Portable Grinding machines (Pneumatic/ Electric), cutting machines, digital weighing machine,Theodolite/Leica machines with accesorries, Special lifting Tackles (for normal handling), Slings (duly certified by competent authority) and shackles required for lifting & shifting, lifting clamps (Magnetic clamps are

not permitted) for normal handling, CI block/ base plate required for fabrication work is in subcontractor's scope.

2.11 **Measuring Tools.** Calibrated / tested measuring instruments like measuring tapes, dial gauges, feeler gauge, Vernier, micrometres, spirit levels, steel scales, try squares, plum bobs etc.are in subcontractor's scope. The tools/ instruments are to be calibrated/ tested regularly and certified through NABL approved lab/ traceable to national standards

2.12 All necessary lifting and shifting tools, blocks, slings, tackles and shackles, duly tested and certified. Ropes and chains are not to be used for handling of material.

2.13 Sub-contractor has to make arrangement of his shed in open space inside MDL for fabrication work.

2.14 Contractor has to bring their own porta cabin and lockable space lock and key. Electrical connections will be provided by MDL.

2.15 Forklifts, hand trolley for material handling are to be arranged by the contractor.

2.16 Subcontractor has to take connection from the power supply points shown by MDL. However, lead wires and bulbs to be arranged by the contractor. Additional Lighting arrangement at the site (apart from general lighting at W/s) is to be provided by the subcontractor as per requirement).

2.17 The subcontractor shall execute the work in accordance with relevant documents, drawings, protocols, specific directives or instructions as per requirements.

2.18 The subcontractor is required to study the Work Instruction and inspection protocol sheets given by MDL. The works are to be carried out as per details in WI. These documents are to be preserved by the subcontractor for reference and to be returned progressively for respective jobs.

2.19 All relevant data for fabrication. installation, degutting, regutting. overhauling testing activity to be maintained / Updated in the soft format day to day and this data should be made available when ever required on MDL Instruction.

2.20 **PPE (Personal Protective Equipment):** Standard PPE like safety shoes, helmet, gloves, respiratory masks (FFP3 type), Wide vision (panoramic) safety goggles to be used and is solely subcontractor's responsibility.

2.21 **NDT**: Subcontractor should have In-house/ outsourced facility for various NDT's such as RT, DP, MPI, UT etc. The firm should have NDT level II Engineers.

2.22 Theodolite/Leica Marking /inspection is to be arranged by sub-contractor.

2.23 **Quality Management Systems.** Dedicated QA Engineer with staff assistance. Proper documentation of every stage of work like material identification, material collection, marking, template inspection, edge preparation, Fit-up inspection, Weld visuals, NDT, final dimensional checking, inspections etc in the prescribed format of earlier/ existing work undertaken.

2.24 An adequate computer for viewing of relevant documents/ drawings pertaining to work. The computers should have minimum following software like Microsoft Office, Auto-CAD etc

2.25 **Mobilization** Contractor shall complete mobilization of his workforce, tools, moulds and equipment within ONE weeks from date of award of order or intimation by site manager. In mobilization period contractor should arrange entry passes for his employees & no excuse for delay in commencing work on this account will be entertained. Firm is to mobilize manpower within 7 days of order placement for welder qualification and fabrication work. Failing with which is liable for LD.

2.26 **Working Schedule** The contractor has to prepare a micro-level plan of activities for each month. If contractor is required to work in all shifts, including Saturday, Sunday, holidays or as and when necessity arises, the contractor is to make necessary arrangements. MDL will provide necessary assistance to the contractor.

2.27 The subcontractor will be required to follow all safety norms and procedures to ensure safety of men and materials (with respect to theft, fire, accidents or any other incidence). The operatives shall wear safety shoes, helmets, boiler suits, grinding shields, goggles, safety belts, and hand gloves etc. as part of safety rules. The subcontractor shall install fully equipped First Aid box near the site.

2.28 The subcontractor has to maintain high standard of hygiene and house-keeping on cradles and surrounding areas.

2.29 Delicate equipment and panels would require to be adequately protected with plywood boxes/ canvas/soft covers during movement/ installation of other equipment, devices, pipes etc. in close proximity. Accordingly, carpenters may be deployed as required.

2.30 With regard to preservation of coated surfaces, the subcontractor has to ensure decks, platforms, foundations and structures which are coated finally are properly protected by covering with adequate covering material prior to commencement of any outfitting work in the vicinity. Utmost care is to be taken not to damage any coated surface during Installation work.

Damages, if any, are to be repaired by the subcontractor at own cost in consultation with MDL officers as per specifications in the relevant documents and drawings

2.31 **Manpower**

I. Sufficient number of ITI qualified Skilled & Semi-skilled fitters, riggers, welders, Brazers, grinders, painters, carpenters, electricians, store-keepers, material handlers, helpers etc. are to be deployed for carrying out the activities as per schedule and time. The high technology and high accuracy jobs are required to be undertaken on MRSSK submarines and require adequately trained highly qualified personnel to be deployed for these jobs.

II. The qualifications will be authenticated by MDL officers. Those deployed shall be Conversant in reading of engineering drawings and documents.

III. Qualified Engineers & supervisors: At least two engineers & six supervisors are to be engaged for execution of this subcontract.

IV. Degree/Diploma Engineers in the disciplines of mechanical Engineering and Supervisory Staff with technical background having min. 2 years of experience in similar work preferably in Shipbuilding shall be deployed and are entirely responsible for execution of the tasks as per specifications in the relevant documents and drawings.

V. A dedicated QA engineer(s) with staff assistance.

2.32 **Organization Management:**

a. Subcontractor must take into consideration the nature of tasks to be carried out and the level of responsibilities associated while putting the organization in place. The subcontractor shall nominate suitable contact persons for the smooth execution of the contract.

b. During the activities, the subcontractor should provide name, function and phone number of all persons working in MDL's site in order to communicate easily. The subcontractor should also take into consideration that during the activities, the inspections and break points will be imposed by MDL.

c. The subcontractor is required to depute a nodal person who will be interacting with the MDL representative who will be nominated on placement of order. The detailed work-site organization will be put in place in consultation with the subcontractor after placement of order.

d. Subcontractor is required to keep daily log book of persons working in the yard, work carried out, material taken over, material installed and

obtain signature of site in charge. The format of such records is to be mutually decided between MDL and contractor.

2.33 Subcontractor shall keep the MDL informed regarding the progress of the work throughout the entire contract period. Contractor shall submit weekly progress report.

2.34 The subcontractor will render a monthly progress report also of all activities being carried out on 1st of every calendar month. This shall be jointly reviewed to resolve issues. Format of such report will be given after award of contract.

2.35 Extensive documentation is required during the execution of the work to ensure traceability, which is important for Quality Assurance. The contractor has to create the documents promptly during each stage of work

2.36 Material handling within and outside the yard**:** The subcontractor has to arrange suitable vehicles / forklifts / hand trolleys for transportation of material within and outside the yard.

2.37 Any material, equipment, infrastructure facility, required directly or indirectly for completing the subject work, as per the scope of work & drawing given, if not mentioned in MDL's scope, has to be arranged by the subcontractor without any extra cost to MDL.

3. **WELDER QUALIFICATION**

3.1 Welding machines for qualification of welders at MDL premises

3.2 Welding test coupons of required thickness and the consumables (electrodes) required for welders' qualification tests are in subcontractor's scope. WPS/PQR/welding qualification is in subcontractor's scope.

3.3 NDT test is required for welder's qualification

3.4 On receipt of the Order, welder qualification must commence within 7 days of time to enable early start of fabrication work.

3.5 Welding qualification as per MIL 248D specifications is to be done and may take weeks' time or more depending on the quality of welder sent by subcontractor for qualification.

3.6 The plan for welder's qualification has to be worked out by the subcontractor with OIC (QA-EY) and OIC (W-EY) soon after the placement of order.

3.7 The subcontractor has to qualify sufficient number of welders (at least 3 Nos.) for non-HY80 and LN 44 materials in all MAG welding for fillet and butt weld for plates thickness 3 mm and above (as per job requirement) as

per welder's qualification procedures. QA-EY/RMT will qualify the welders at MDL.

3.8 In view of this, the subcontractor shall deploy minimum 3 qualified welders by any approved third party, so that their training & qualification could be started immediately on placement of Order and to meet the delivery schedule of structures.

3.9 The welding qualification plan is to be understood for the welder qualification. It may be noted that the "Welder Qualification" has various stages, which have to be qualified step by step by the welder. In order to qualify finally, so that the welder can be deployed / allowed to work on the plates and sections.

3.10 It is absolutely essential that the welders who are required to be trained for deploying on these jobs must be on the permanent rolls of the subcontractor's firm.

3.11 Once the welders nominated by Firm are qualified by MDL for the subject work, they will be deployed continuously on this job.

3.12 The original certificate of qualification of these welders will be kept with QA-EY Department for MDL record. In case of quitting of the trained & qualified welders, the qualification of additional welders at MDL will be on chargeable basis to the subcontractor.

4. <u>Inspection and test:</u>

The stage inspection & final inspections will be carried out by MDL (QA-EY) and Naval Inspection Authorities ie SRMT. The defects rectification / rework applicable after any stage of inspection shall be carried out by subcontractor at no extra cost. All the work carried out by subcontractor will be accepted only after the final clearance from MDL (QA-EY) and Naval Inspection Authorities ie.SOT(MB). The decision of the Inspection Authority on any question of intent, meaning and scope of the work / documents/ specifications / standards shall be final and conclusive and binding on subcontractor.

A) Inspection will be undertaken by QA-EY, RMT as per approved QAP.

B) Destructive tests required for fabrication of structures are to be arranged by the subcontractor at their own cost at Govt. approved lab.

C) The subcontractor(s) have to arrange all the required Non-destructive testing as per drawing & COS. (to be conducted in laboratory) such as RT, DP, MPI, UT, etc. to be taken at various stages as indicated by the inspection agency at their cost. Class II film to be used for RT report.

d) The defects rectification / rework applicable after any stage of inspection shall be carried out by subcontractor at no extra cost to MDL. All the work

carried out by subcontractor will be accepted only after the final clearance from MDL (QA-EY) and Naval Inspection Authorities i.e. RMT (MB).

e) The decision of the Inspection Authority on any question of intent, meaning and scope of the work / documents/ specifications / standards shall be final and conclusive and binding on subcontractor.

f) Radiography of welded joints. (Contractor has to utilize MDL approved contractor on payment basis.)

5. **QAP.** Draft QAP is enclosed as per Annexure-1. The subcontractor is to prepare and submit the final QAP to MDL for approval within 05 days of placement of order.

6. Quality of Product.

a) The subcontractor must ensure dimensional accuracy and control welding distortions. It is, therefore, absolutely essential to follow the procedures as mentioned in the documents provided.

b) The tolerance requirements given in the drawings and documents are very stringent. It is therefore necessary that contractor keeps quality requirement in mind and ensure that work is done to best of accuracy.

c) On any defect, a Non conformity report (NCR) is to be raised. The detailed procedure of NCR is to be understood by the subcontractor and implemented. The repair orders are to be approved by the concerned authorities.

d) All anomalies detected during the fabrication/ machining should be traced by Non Conformity Report (NCR). The subcontractor will have to establish and manage the NCRs in accordance with given documents and procedures & will address the same to QA-EY for its decision. In case of non-conformity, QA-EY will advise NCR procedure. The above document is available for verification with QA-EY. The subcontractor has to comply with NCR procedures.

e) The subcontractor shall take all necessary precautions to minimize wastage/rework/damage during fabrication. Any such damages / nonconformities may be repaired with prior approval of the Production Officer in-charge and QA-EY of MDL and relevant documents are to be prepared.

7. QA REQUIREMENTS AS FOLLOWS:

a. Welding procedure specification WPS/ procedure qualification record (PQR) to be submitted for quality assurance- east yard approval.

b. Quality assurance plan is to be prepared by sub-contractor and for the same the part is required to consult quality Assurance-East yard officials for approval prior to submission.
c. All inspection stages will be carried out as per QA plan

8. **Work completion certificate(WCC):**
   Work Completion Certificate (WCC) shall be issued on satisfactory completion of respective work with inspection and acceptance reports. The agency responsible to issue WCC shall be MRLC

9. **FIM BG/INDEMITNITY BOND /INSURANCE**:
   Any material is required to be taken outside MDL by subcontractor, same will be allowed only on submission of FIM-BG. The cost of FIM-BG will be provided on case to case basis & on as and when required basis.
10. **Guarantee /warrantee**: supplied items shall be warranted for 12 months from date of installation and commissioning. Valid warranty certificate must be submitted. During this period, all defect arising out of defective material and faulty workmanship will be rectified by repairing or replacing part or whole material as necessary free of charge on delivery basis. Any consequential damage/defect or loss of item due to poor workmanship/poor material quality/ negligence etc. attribute to the bidder to be rectified / replaced by the bidder free of cost.
11. **Rework**. Any rework arising due to MDL will be paid extra as per the man-days rates indicated in the rate sheet.

Note

1. Any material, equipment, infrastructure facility, required directly or indirectly for completing the subject work, as per the scope of work & drawing given, if not mentioned in MDL's scope, has to be arranged by the subcontractor without any extra cost to MDL.
2. In case of the performance of the contractor is not satisfactory MDL reserves the right to cancel the order and lift the material from contractor.

12. Passes: Obtaining police verification/clearance for each personnel being deputed to MDL is a pre-requisite for issue of MDL Security pass for entry into East Yard. The firm should arrange/furnish all requisite documents to Security department immediately on receipt of Order. Subcontractor may contact Security department for guidance.
13. **TRANSPORTATION:**
    a. Safe transportation of MDL material required even inside MDL premises. If any damage occurs during transportation, the contractor has to rectify the

same at MDL premises as per MDL procedure at their own cost. The final acceptance will be in MDL premises.

b. No payment will be made for any transportation trips

2. ANNEXURE II

All below drawing to be refereed for, removal, survey and reinstallation. Incase of any renewal and repairs happens same is to be arranged by subcontractor including welding

S NO	DRG NO	List of Hull Equipment
1.	186/1782-10-00-00	RESCUE SPHERE GENERAL ARRANGEMENT
2.	186/1170-06-00-00	INSTALLATION TOLERANCES OF RESCUE SPHERE
3.	186/1276-14-00-00	FLOATING BODY FOR RESCUE SPHERE (will be supplied by MDL) removal and installation will be subcontractor scope.
4.	186/1276-14-12-00	GRP - FLOATING BODY
5.	186/1611-50-00-00	FLAPS IN FLOATING BODY(will be supplied by MDL)
6.	186/1611-51-00-00	COVER FOR AIR MAST(will be supplied by MDL)
7.	186/1289-99-09-00	STRUC. OF LAMINATE FOR FLAPS IN FLOATING BODY
8.	186/1289-99-04-00	STRUC. OF LAMINATE FOR ROWS OF SEATS & STOWAGE BOX FOR RESCUE SPHERE
9.	186/1289-99-11-00	STRUC. OF LAMINATE FOR LINING COVER FOR UPPER HATCH COVER OF RESCUE SPHERE
10.	186/1611-52-00-00	LINING COVER FOR UPPER HATCH COVER OF RESCUE SPHERE
11.	186/1613-09-00-43	SEALING FOR RESCUE SPHERE
12.	186/1633-09-00-00	ACCESS LADDER TO RESCUE SPHERE
13.	186/1642-05-00-00	RAILING WITH STOWAGE FOR RESCUE SPHERE
14.	186/1695-12-00-00	SUPPORT SOCKET WRENCH FOR RESCUE SPHERE
15.	186/1780-02-00-00	DISTRIBUTION OF PLACES IN THE RESCUE - SPHERE
16.	186/1782-04-00-00	HANDLE AND LADDER IN RESCUE SPHERE
17.	186/1782-05-00-00	ROW OF SEATS IN RESCUE SPHERE
18.	186/1782-06-00-00	FLOOR RESCUE SPHERE
19.	186/1782-07-00-00	ANODE PROTECTION IN RESCUE SPHERE
20.	186/1782-08-00-00	RESCUE SPHERE EQUIPMENT
21.	186/1782-09-00-00	FASTENG FOR BATTERY IN THE RESCUE SPHERE
22.	186/1782-11-00-00	KEY FOR FLAPS / RESCUE SPHERE

23.	186/1782-12-00-00	SHIFT LOCK FOR UPPER HATCH COVER OF RESCUE SPHERE
24.	186/1782-15-00-00	GUIDE AND SUPPORT FOR RESCUE SPHERE
25.	186/1782-30-00-00	RESCUE SPHERE (STEEL STRUCTURE) WELD PARTS (PENETRATIONS)
26.	188/1782-32-00-00	RESCUE SPHERE MACHINING (PENETR.)
27.	186/3317-01-00-00	MOUNTING PLAN POWERSUPPLY BOX FOR RESCUE SPHERE
28.	186/3479-03-00-00	EQUIPMENT LIST FOR RESCUE SPHERE
29.	186/9150-05-00-00	BALLAST OUTLINE PLAN FOR RESCUE SPHERE
30.	186/9150-05-00-02	BALLAST WEIGHT FOR RESCUE SPHERE
31.	186/9199-77-00-00	SUPPORT FOR BREATHING MASKS IN THE RESCUE SPHERE
32.	186/1782-02-00-00	TRIPPING HOOKS FOR ESCAPE SPHERE
33.	186/1782-03-00-00	LOCKING DEVICE FOR ESCAPE SPHERE
34.	186/4678-09-00-00	VENTILATION ASCENT SPHERE
35.	186/4213-04-00-00	DRIVE LINKAGE FOR ANCHOR WINCH (ANODE)
36.	186/4213-04-00-00	DRIVE LINKAGE FOR ANCHOR WINCH (ANODE)
37.	186/4218/03-00-00	ANCHOR CHAIN SDLIPPING EQUIPMENT (ANODE)
38.	186/4218-02-00-00	DRIVE LINKAGE CHAIN (ANODE)
39.	186/4218-01-00-00	CHAIN STOPPER (ANODE)
40.	186/1276-01-00-00	INFLATABLE LIFE RAFT CONTAINER(ANODE)
41.	186/1782-13-00-00	Zinc anode in area of calotte
42.	186/4553-02-00-00	COVERING FOR GARBAGE IJECTOR (ANODE)