



MAZAGON DOCK SHIPBUILDERS LIMITED

EXPRESSION OF INTEREST (EOI) INVITED FROM FIRMS ESTABLISHING A DESIGN AND ENGINEERING CENTER FOR DESIGN, PLANNING & MANUFACTURING (I.E SUPPLY OF DESIGN SOFTWARE) IN SUBMARINE CONSTRUCTION

EOI no. EY/D/IT/EOI/04 dated: 12 May 2022

Corrigendum No. 1

The Corrigendum No. 1 is being issued for following:

- (A) The following serials are in addition to Sr. 14 i.e. Technical Qualification of Pre-Qualification Criteria (Section-4).
- (e) Few Serial numbers from Scope of work of Annexure 3 in EOI are made mandatory for Pre-qualification criteria. The list is annexed with column "Mandatory" in this corrigendum as Annexure 3a. Bidders not fulfilling any of these mandatory serial numbers will be disqualified.
 - (f) Bidders should be Original Equipment Manufacturers (OEM) of Software.
- (B) The following point is in addition to Sr. 17 i.e. Bid Rejection Criteria of Section 5.
- (k) Bidders failing to submit the filled Annexure 3a of Corrigendum will be disqualified.
- (C) The following points are in addition to Scope of Work in Annexure 3 of EOI.
- a. Bidder should fill and submit Annexure 3a as a part of Bid document.
 - b. Bidder will be responsible for Supply, Installation, Testing and commissioning (SITC) of
 - i. Software(s),
 - ii. Hardware's (Server(s) and storage at Primary site (MDL), Near Disaster Recovery site (MDL) & Far Disaster Recovery site (Bangalore), 15 nos of Workstations with Windows OS, Network switches and requisite accessories in support of their platform etc.) with 5 years comprehensive warranty.
 - c. Bidder will also be responsible to configure Near DR (MDL, Mumbai) and Far DR (Bangalore) setup for their platform solution.
 - d. Bidder should supply software platform with 5 years AMC support or one year AMC support with provision to extended the AMC annually with basic rate and annual escalation if any.
 - e. Bidder should also supply Backend & Frontend software package for servers (Operating System and Database Server etc.) in support of their platform.
 - f. Bidder will be responsible to supply Software in 2 weeks.
 - g. Bidder will be responsible to supply of Hardware in 6 weeks.
 - h. Upon delivery of software, bidder should install their platform setup on existing MDL infrastructure and later on migrate on new infrastructure (servers and workstation) as and when delivered and commissioned by bidder.

- i. Post order placement, Bidder should bring a fresh portable hard disk/ DVD(s) for installation of their software package in the MDL during implementation. The proof of invoice (serial of portable hard disk should be mentioned in invoice) to be shown to MDL for newly procured Portable hard disk. Hard Disk/DVD(s) brought inside MDL will be MDL's property thereafter.
- j. Bidder should provide PLM software encompassing functionalities of Planning, Design, QA, Commercial, Production, Stores and Outfitting.
- k. Bidder should provide PLM software addressing all the underwater platform Design and construction business process, change management with integrated reporting and Dashboard along with document management system.
- l. Bidder will be responsible for customization of the PLM software for meeting the Functional requirements at MDL.
- m. Initially, Server should be able to handle 50 PLM users and should be scalable to 500 PLM users. Following figures are indicative in nature
 - i. Planning - 6
 - ii. Commercial - 5
 - iii. QA - 4
 - iv. Production - 5
 - v. Design - 20
 - vi. Stores - 2
 - vii. Outfitting - 8
- n. Software platform should be capable of integrating Industry 4.0 solutions and Support 3rd party industry 4.0 solutions- The following used cases are only indicative and not limited to
 - i. Predictive Maintenance,
 - ii. Energy Management,
 - iii. Smart warehousing,
 - iv. Material Tracking with RFID, Bar codes etc.
 - v. Robotics,
 - vi. IIOT
- o. Proof of Concept (POC)- Bidder should demonstrate all points of Annexure 3a through a 1D & 3D model developed by bidder. The Problem statement for demonstration of capability of software platform is enumerated as follows:
 - i. An underwater platform with a design external pressure of 5 bar.
 - ii. Hull material is mild steel.
 - iii. Shell Thickness 10mm, length of 10,000mm, dia 4000 mm.
 - iv. 5 equidistant stiffeners from the cylinder edges. Stiffeners are T shaped with 10x100mm cross section of both web and flange.
 - v. Two tori spherical end bulkheads of max thickness 10mm are welded to the cylindrical shell.
 - vi. A major entry coaming of 1000 mm dia with a hatch is at the top and a penetration of 100mm dia is present at the bottom.
 - vii. Platform has 2 Internal Tanks, 2 equidistant decks and 2 external Ballast Tanks.
 - viii. 2 HP air cylinders at 100 bar are present inside the ballast tanks.
 - ix. A 4 bladed Propeller of 1m diameter with shaft penetrating aft bulkhead connected to a propulsion motor with a 100KW load.
 - x. Hotel loads of 50 KW (2 AC, 2 sonars, 10 lights, control electronics, 1 communication antenna).

- xi. A seawater pump against external pressure with flowrate of 5m³/hr is present.
 - xii. Platform power supply is from an in built Li ion battery pack of 500 KWH.
 - xiii. Any other necessary data may be assumed as necessary.
 - xiv. Design process via the steps detailed in the EOI is to be demonstrated. For stability, the model must be imported into PARAMARINE software with geometry and section planes intact.
 - xv. Bidder should submit Soft copy of POC project case study to MDL.
- p. All payments will be in INR only.
- q. Software Training- Bidder will provide all trainings in MDL. No of batch (i.e 1 batch of 10 trainees) is indicative. Bidder to provide appropriate no of days of training for each topic enumerated below.

Sno	Section	Number of Batches	Licenses
1	Concept Design/Physics Software/1D analysis	1 batch	4
2	Basic Design Engineering	1 batch	4
3	Basic Design Electrical	1 batch	2
4	Detailed Design	1 batch	6
5	Drafting	1 batch	6
6	Analysis : FEM	1 batch	2
7	Analysis : CFD	1 batch	2
8	Other analysis: Acoustics, etc	1 batch	2

- r. PLM training to MDL users in Phased manner. Initially 50 users, progressively to reach up-to 100 users.
- s. Above mentioned software license are indicative, may increase in future. Bidder to provision of rate contract with MDL for supply of Licenses with annual escalation if any.
- t. Onsite support and Hand holding with respect to design software's, design module customisation and PLM customisation on Manday Basis.

(C) Rest all other terms & conditions of this EOI will remain unchanged.

For Mazagon Dock Shipbuilders Limited

s/d

GM (Services-EY)

Annexure-3A

Eol No. EY/D/IT/EOI/04

Scope of Work for Establishing a Design and Engineering center for Design, Planning & Manufacturing (i.e supply of Design Software) in Submarine Construction

Sr. no.	Criteria	Category	Mandatory	YES/NO	Software Name and Version	Module Name	Remarks
1	Prerequisites						
a	Experience in Establishing a Design and Engineering center for Design, Planning & Manufacturing (i.e supply of Design Software) to Defense Shipbuilding related organization	Prerequisites	Yes				
b	Whether Design software is parametric in nature	Prerequisites	Yes				
c	Whether Platform is part of a proven PLM system in Defence shipyard (If yes, kindly provide examples)	Prerequisites	Yes				
d	Whether Software is holistic and provides a common design platform for all users with controllable access rights	Prerequisites	Yes				
e	Whether Software is centralised in nature such that all users work on the same model with various degrees of authority to edit, update on one single platform with all capabilities built in/plugged in.	Prerequisites	Yes				
f	Whether Solution has provision to give rights for importing and exporting of data outside the environment	Prerequisites	Yes				
g	Whether Platform / solution offered enables reuse of concept design data to build 3D based detailed deliverables and experiences (e.g. Virtual Reality/Augmented Reality) to allow the shipbuilding company to efficiently and effectively communicate concept to the ship owner without any conversion of the data. This should be possible via various media such as tablets, display screens, VR glasses, etc.	Prerequisites	Yes				
2	Concept Design						
a	1D Modeling and analysis of multi domain complex physical system which includes a combination of Hydraulic, Thermal, Pneumatic, Electrical, Electronic and Mechanical systems.	Concept Design	Yes				
b	The Software should contain predefined components for different complex physical models especially in marine application.	Concept Design	Yes				
c	Design and Analysis of 1D Systems, both mechanical and electrical and with the solution interlinked with graphics, 2D and 3D CAD as well as analysis softwares to evaluate feasibility of the system and to facilitate quick changes at the system level. Output must be graphical ie in the form of 2D,3D graphs, moving parts, in built animations, dashboard, etc. Must also include capability to link together multiple such systems to create a final physics based platform to evaluate feasibility and to obtain preliminary specs.	Concept Design	Yes				
d	Solution must necessarily contain a library with objects and related data for Hydroplane shapes, Data for rudder creation and selection, Data for creation and Propeller Selection along with templates for the same.	Concept Design					
e	Library must contain objects and all necessary data for control systems, signal generation and processing, power electronics and other electrical devices required for marine applications	Concept Design					
f	Library must contain objects and all necessary data for all engineering devices used in marine applications along with all necessary documentation.	Concept Design					
g	Built in features to calculate common engineering problems applicable to marine environments, Hydraulic, pneumatic, or any other such. Selection of major engineering equipment such as engines, moving parts, pumps, etc must be possible at this stage with preliminary specs.	Concept Design					
h	Initial Design features focusing on all marine requirements such as estimated resistance, propulsive forces, seakeeping, hydrodynamics, stability, tank conditions, tank sloshing effects, weight calculations, etc	Concept Design	Yes				

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i	Initial Design features focusing on preliminary electrical design including motor selection, thrust, torque values. Power consumption, load balancing, battery pack design (lead acid, Li Ion, fuel cells, etc), circuit design, earthing circuit design, control circuits, static and dynamic mechanical/electrical interfacing and analysis.	Concept Design	Yes				
j	Overall Platform performance such as underwater trajectory, navigation chart mapping, endurance, indiscretion rates, etc.	Concept Design					
k	Integration of Trim/List/Roll (6DOF motion) motion analysis with defined ranges and integration and impact of the same on the 1D systems during motion of the platform.	Concept Design	Yes				
l	Time based analysis of all of the above with capability to use variables within a range of values for optimisation of design.	Concept Design	Yes				
m	All the features above must be available on one platform for concept design where multiple users will be able to create various systems and finally integrate and run to evaluate feasibility of the design. The features mentioned must be applicable to submarines and underwater platforms such as drones, ROVs,AUV's etc.	Concept Design	Yes				
3	Evaluation of the following commonly encountered problems using 1D solution as mentioned above :						
a	Mechanical						
i	Emptying of Ballast Tanks using HP air at varying pressures (Isothermal Process) in deep sea submerged condition.	Design problem					
ii	Evaluation of open circuit during pumping out of sea water into deep sea from a tank (infinite external volume).	Design problem					
iii	Evaluation of Pressure and flow in a closed water circuit.	Design problem					
iv	Thermal calculations for a cooling circuit and heat exchanger capacity design/evaluation.	Design problem					
v	Propulsion Motor Selection in 1 D System Design	Design problem					
vi	Optimisation of Hydroplane and rudder shapes based on parametric NACA profile	Design problem					
vii	Solution of atmospheric evaluation problems with variables such as Oxygen consumption and CO2 release etc. to determine amount of breathable air and time	Design problem					
viii	Electro-Pneumatic assemblies	Design problem					
ix	Evaluation of Pneumatic operation of mechanical devices such as Retractable masts, Pneumatic valves (evaluation for number of operations, pressure required etc.)	Design problem					
x	Selection of Engine as per platform requirement						
b	Electrical - System Analysis- Simulation of Electrical and Electronics Circuit from a schematic by inputting parameters.						
i	Power supply analysis of different power sources like DG set, batteries, Fuel cells and solar etc.	Design problem					
ii	Endurance evaluations of different power sources as per user defined loads.	Design problem					
iii	Thermal analysis and performance analysis of different power sources.	Design problem					
iv	Design of cooling system for both electrical and mechanical equipment.	Design problem					
v	Evaluation of electrical harmonics, short circuit rating, fault analysis and voltage variations of equipment, cables, panels and systems.	Design problem					
vi	Evaluation of load analysis using parametric variables of time, individual device power consumption and losses to optimise power consumption and increase efficiency of a circuit.	Design problem					

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Sr. no.	Criteria	Category	Mandatory	YES/NO	Software Name and Version	Module Name	Remarks
vii	Evaluation of performance based on different battery charging levels.	Design problem					
viii	PLC coding and simulations of control systems.	Design problem					
ix	Power electronic design and analysis for development of controllers/drives.	Design problem					
x	Simulation of Battery monitoring system for batteries.	Design problem					
xi	Signal analysis of sonar : Ability to model DSP simulator to perform signal form a 3D sonar image of the target including filtration and directivity synthesis	Design problem					
xii	Evaluation of accoustic interference (like sonar and echo sounder frequency interface).	Design problem					
c	Platform Performance- Creation of a physics based model of the platform to evaluate performance from the system schematics.						
i	Evaluation of platform behaviour.	Design problem					
ii	Evaluation of Platform dive trajectory.	Design problem					
iii	Evaluation of objectives such as endurance, habitability etc.	Design problem					
4	Building the light weight representation of Ship structure plates & profiles using the 3D solid model of the Hull form as input.	Preliminary Design	Yes				
5	Any change to 3D model should automatically update the Basic design.	Preliminary Design					
6	Usage of dedicated tools to create the 1D & 2D sections for FEM Analysis. Build the mesh for structural analysis.	Preliminary Design					
7	Mid Surface Generation from 3D CAD model for importing to FEM solver	Preliminary Design					
8	Creation of the General Arrangement drawings for Class approval.	Preliminary Design	Yes				
9	Mechanical piping & electrical schematics would be built at this stage.	Preliminary Design					
10	Creating standard parts, primary & secondary structures, seatings,mounts and foundations. Selection from standard inbuilt catalogue for the same.	Detailed Design	Yes				
11	Software must necessarily have inbuilt templates for submarines and ships for quick creation of commonly used structures such as frames, flat and curved bulkheads, curved reinforcements/stiffeners, tanks, and all other such submarine specific structures as well as as commonly used marine structures.	Detailed Design	Yes				
12	Piping Routing, clamping and Modelling 3D mechanical piping (should include international design standards and customisation).	Detailed Design					
13	Automatic routing as well as auto clamping on the basis of proximity rules, etc.	Detailed Design					
14	Cable Routing, connecterization with electric cabinets and Modelling 3D cabling using input data (should include international design standards and customisation).	Detailed Design					
15	3D modelling and outfitting of electrical equipment using input data and imported CAD models	Detailed Design					
16	Detailed spatial outfitting of electrical and electronic parts inside a cabinet.	Detailed Design					
17	Outfitting of all equipment, mechanical and electrical with in built/definable proximity rules, etc as necessary	Detailed Design					
18	Inbuilt design rule checks: International and mil standards	Detailed Design					
19	Supports multiple design in a project and multiple sheets in a design	Detailed Design					
20	Rule based auto routing in 3D, based on equipment, cable ways and routing constrains. User should be able to override the auto result or create manual if required.	Detailed Design					
21	Inbuilt library for standard parts, equipment from international vendors for marine applications etc.	Detailed Design	Yes				

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Sr. no.	Criteria	Category	Mandatory	YES/NO	Software Name and Version	Module Name	Remarks
22	Automatic / Customized Nomenclature.	Detailed Design	Yes				
23	Automatic calculation of mechanical properties such as Weight, Permeability, Volumes, Material, Density, CG etc.	Detailed Design	Yes				
24	Definition of all properties of each model, mass, material etc.	Detailed Design					
25	Import of CAD models of various formats and integration into platform.	Detailed Design					
26	Creation of CAD library for future use and usage of existing CAD library.	Detailed Design	Yes				
27	Animation of system results as per 1D analysis and customization.	Detailed Design					
28	Acquisition and Comparison of real-time parameters of electrical and mechanical systems of Platform with 1D model for analysis and effective design of a Submarine Platform.	Detailed Design					
29	Multiple views of Design for viewing Functional, Zones	Drafting Tools					
30	Hull Drafting.	Drafting Tools					
31	Pipe Installation drafting	Drafting Tools					
32	Pipe fabrication drafting: Automatic spool and foundation drawings along with bend table based on bending machine available in Yard.	Drafting Tools					
33	Outfitting drafting	Drafting Tools					
34	Automatic annotations	Drafting Tools					
35	Automatic generation of manufacturing drawing from 3D model (frame wise and Baseline wise)	Drafting Tools	Yes				
36	Automated Pull Sheet Printing	Drafting Tools					
37	Generation of CNC codes (G-code), Piping Drawings, Nesting Plans etc	Drafting Tools					
38	2D Nesting layouts & CAM Program output for plate cutting. (MDL currently uses 'Act/cut' from ALMA cam for 2D nesting & CAM program output for plate cutting)	Drafting Tools					
39	GA designing of electrical and electronics cabinet	Drafting Tools					
40	Multiple views of Design for viewing System BoM	Drafting Tools					
41	Manufacturing information generation from Detail 3D Model	Drafting Tools	Yes				
a	Create hierarchical manufacturing assembly from 3D detail and it should adopt to manufacturing change on manufacturing user acceptance without manually implementing the change	Drafting Tools					
b	Method to automate welding creation along with Weld-edge preparation, weld-process parameter and properties	Drafting Tools					
c	Generate marking lines for manufacturing for all the welded object on given plate	Drafting Tools					
d	Create rolling line for curved plates for bending	Drafting Tools					
e	Capability to create plate development for curved plate for plate cutting profile	Drafting Tools					
f	Create plate template from detail 3D model for inspection purpose for curved plate	Drafting Tools					
g	Add green material on plate for manufacturing assistance	Drafting Tools					
h	Generate invers bending curve for bend stiffeners	Drafting Tools					
i	Ability to reintegrate updated data from manufacturing after construction, such as deviations, etc	Drafting Tools					
j	Deep integration of above data with planning, QA-QC and etc	Drafting Tools					
k	Automatic generation of all drawings for classification society approval.	Drafting Tools					
42	Parametric connection between 1D, 3D model and analysis softwares.	Interoperability	Yes				

Annexure-3A

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Sr. no.	Criteria	Category	Mandatory	YES/NO	Software Name and Version	Module Name	Remarks
a	A 3D model made at the basic/detailed design stage will be sent directly for FEM/CFD or any other analysis or imported directly into PARAMARINE with all native object properties & geometric properties intact, etc.	Interoperability	Yes				
b	The crux of the problem is to prevent remodelling in various softwares and to prevent data loss in any form whatsoever while carrying out analysis. Native solutions with deep integration to be provided for the same.	Interoperability					
43	Finite Element Method:	FEM Analysis	Yes				
a	Provision of Native meshing and inbuild capability to export the native mesh to any other FEM analysis software as orphan mesh without losing any properties.	FEM Analysis	Yes				
b	Should have a powerful pre-processor for converting 3D model to 2D Mid-surface shell Model and 2D meshing of the complicated shell model with best meshing elements. Software should be able to intelligently Interact with both stiffener (Beam properties) and shell (Plate theory) elements with minimum user interface.	FEM Analysis	Yes				
c	Exporting CAD models to FEM software and importing results.	FEM Analysis	Yes				
d	Converting 3 D model to 1 D Shell Model for initial prediction of structural behaviour.	FEM Analysis	Yes				
e	Evaluation of models in native FEM: -	FEM Analysis	Yes				
i	Static Analysis (Linear & Non-Linear), Buckling & Dynamic(wave/current/shock) analysis with geometrical imperfections of a stiffened cylinder with penetration undergoing external pressure and interaction with fluid(Fluid-structural interaction) and also calculating the fatigue strength for the number of diving cycles.	FEM Analysis	Yes				
ii	Structural Analysis:	FEM Analysis	Yes				
iii	Vibration and natural frequency Analysis.	FEM Analysis	Yes				
iv	EMI/EMC analysis.	FEM Analysis	Yes				
v	Thermal Analysis.	FEM Analysis	Yes				
vi	Linear and Non Linear Analysis, Plastic and Elastic mode analysis.	FEM Analysis	Yes				
vii	Shell and stiffeners analysis directly from 3D model.	FEM Analysis	Yes				
viii	Evaluation of manufacturing deviations / tolerances.	FEM Analysis	Yes				
ix	Shape Function should be able to interpolate with polynomial functions	FEM Analysis	Yes				
x	FEM Pre-Post should be built on CAD tool with instant dynamic modification and optimization	FEM Analysis	Yes				
xi	Provision for generative optimized design of structures	FEM Analysis	Yes				
44	Computational Fluid dynamics (CFD) :		Yes				
a	Evaluation of the following commonly encountered problems:: Computational Fluid dynamics analysis with marine modules for Surface and Submerged platforms analysis (VOF method, rotating propeller, manoeuvring, Hydrodynamics etc.)	CFD Analysis	Yes				
b	Tools specific to marine applications which includes all kinds of wave equations to aid in getting output like turning circle, hydrodynamic coefficients, zig zag manoeuvres, etc	CFD Analysis	Yes				
c	Animated 3D graphical visualisation of output results and platform	CFD Analysis	Yes				
d	Overset mesh for simulating dynamic operations like propeller rotation, hydroplane swinging, etc.	CFD Analysis	Yes				
e	Model should be able to capture added mass phenomenon, fluid structure interactions, etc.	CFD Analysis	Yes				

Annexure-3A

EoI No. EY/D/IT/EOI/04

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Sr. no.	Criteria	Category	Mandatory	YES/NO	Software Name and Version	Module Name	Remarks
f	Solver should be based on Navier Stokes Equation and should include already well established solvers like K-Epsilon, K-Omega, RANS, etc.	CFD Analysis	Yes				
g	Model has adaptive mesh refinement targeting specific marine physics for overset motion and VOF method	CFD Analysis	Yes				
h	Simulation capabilities to capture Dynamic fluid body interaction motion; self-propulsion; ejection system	CFD Analysis	Yes				
45	Detailed Piping and Engineering Analysis	Piping and Engineering Analysis	Yes				
a	Software should be capable of device level and system level analysis of 3 D piping systems with features such as pipes, bends, valves, all others accessories and Engineering systems for finding out the pressure losses and the output can be used for preparing Technical specifications.	Piping and Engineering Analysis	Yes				
b	The pipe CAD should be importable into the 1D system for system analysis with automatic selection of pipe properties for analysis.	Piping and Engineering Analysis	Yes				
c	Output should be parameters such as device characteristics, pump capacities, Natural frequencies, vibrations and other system level and device level engineering parameters as necessary for each system.	Piping and Engineering Analysis	Yes				
d	Design of HVAC system	Piping and Engineering Analysis	Yes				
46	Stability: Paramarine						
a	Compatibility of Exporting platform model to Paramarine	Stability Analysis					
b	Integration of results in System Design for optimisation	Stability Analysis					
c	Seamless data exchange with hydrostatic software (PARAMARINE)	Stability Analysis	Yes				
47	Acoustic Analysis	Acoustic Analysis	Yes				
a	Engine & Compartment noise	Acoustic Analysis	Yes				
b	Hull noise radiation, cavitaiton	Acoustic Analysis	Yes				
c	Hull Scattering & Sonar, echosounder, other acoustic device, Underwater communication and inter device interference	Acoustic Analysis	Yes				
d	Turbulent Boundary Layer Noise	Acoustic Analysis	Yes				
e	Propeller Noise	Acoustic Analysis	Yes				
f	Determination of platform acoustic signature - Near field and far field analysis	Acoustic Analysis	Yes				
g	Make simulations of acoustics, Measurement of actual acoustics of equipment and platform and their comparison	Acoustic Analysis	Yes				
h	Display of acoustics in graphical 3D spatial format	Acoustic Analysis	Yes				
i	Option to estimate noise absorbtion/reflection/resonance of various materials and shapes such as anechoic tiles	Acoustic Analysis	Yes				
			Yes				
48	Vibration Analysis	Vibration Analysis	Yes				

Annexure-3A

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Sr. no.	Criteria	Category	Mandatory	YES/NO	Software Name and Version	Module Name	Remarks
a	Forced Dynamics response for the Transient, Frequency, PSD, Response Spectrum/DDAM and quasi-static events	Vibration Analysis	Yes				
b	Responses for Displacement, velocity, acceleration, element force, reaction force, stress, strain and FRFs	Vibration Analysis	Yes				
49	Electrical Analysis		Yes				
a	PCB design	Electrical Analysis	Yes				
b	2D schema design of electric circuit	Electrical Analysis	Yes				
c	3D cabinet design	Electrical Analysis	Yes				
d	Cable layout and harness creation.	Electrical Analysis	Yes				
e	The final cable routing layout should be importable into the 1D system for system analysis with automatic selection of cable properties for analysis.	Electrical Analysis	Yes				
f	EMI/EMC analysis of Cables & electrical Devices	Electrical Analysis	Yes				
g	Wire harnesses should be directly imported from electrical schematic software including automatic generation of the 3D path and assignment of properties, making the EMC analysis highly efficient.	Electrical Analysis	Yes				
h	Multiconductor transmission line network (MTLN) solver to perform any EMC-related analysis on the wire harness, such as emission, susceptibility, and cross talk within the bundle and between bundles	Electrical Analysis	Yes				
i	Load balancing and power stability analysis	Electrical Analysis	Yes				
j	Thermal Analysis	Electrical Analysis	Yes				
k	Sonar Analysis & Design : Modelling and simulation of transducers and the sound field of operation to determine signals, System design for 3D Mapping, active/passive sonar positioning, blind spots, range, transducer selection.	Electrical Analysis	Yes				
l	Basics of Antennae Frequency analysis calculations and communication	Electrical Analysis	Yes				
m	Integration of PLC program with any available hardware modules and ability to evaluate real-time test results	Electrical Analysis	Yes				
n	Transducer analysis	Electrical Analysis	Yes				
o	Electrical/Electronic System analysis	Electrical Analysis	Yes				
50	Design Data Management System		Yes				
a	Inbuilt secure design data handling system	Design Data Management	Yes				
b	Design release and revision management for all documents and drawings	Design Data Management	Yes				
c	GUI based search tool for all design data from a central interface (like a search engine)	Design Data Management	Yes				
51	Quality Assurance and Data Management	Quality Assurance/ Quality Control	Yes				
a	Dedicated Module Availability for QA/QC	Quality Assurance/ Quality Control	Yes				
b	Inspection Data Handling System	Quality Assurance/ Quality Control	Yes				
c	Ability to create standard Inspection templates and share across platform	Quality Assurance/ Quality Control	Yes				

Annexure-3A

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Sr. no.	Criteria	Category	Mandatory	YES/NO	Software Name and Version	Module Name	Remarks
d	Ability to create Trial documents and share across platform	Quality Assurance/ Quality Control	Yes				
e	Ability to create stage wise approval of inspections/trials with designated approvers	Quality Assurance/ Quality Control	Yes				
f	Integration of QA/QC components with planning modules and dashboard to track progress	Quality Assurance/ Quality Control	Yes				
g	Integration of all QA/QC components with hand held tablets	Quality Assurance/ Quality Control	Yes				
52	PLM & PDM						
a	Two-way integration with SAP-HANA	PLM & PDM	Yes				
b	Must have capability to encompass full lifecycle of ship development including project governance, initial concept design, detail engineering\design, production planning, and manufacturing/quality execution.	PLM & PDM	Yes				
c	Integration with Industry 4.0 digitisation in the form of Tablets, Computers, Kiosk etc	PLM & PDM	Yes				
d	Customisable Dashboards for Review and Management reporting. Rights to customise the Dashboards	PLM & PDM	Yes				
e	Web Interface views for Production or Light Users	PLM & PDM					
f	Capability to handle Data / Feedback from Machine for Preventive/ Predictive Maintenance	PLM & PDM					
g	Capability to integrate 3 party software for warehouse management, RFID technology etc	PLM & PDM					
h	Capability to integrate with AR/VR features	PLM & PDM					
i	Document management to be an integral part of the project management system and not a separate application.	PLM & PDM	Yes				
j	To have lifecycles for documents based on the classification of the document – ex: contract document, engineering drawing, internal memo, project issue report, etc.	PLM & PDM					
k	System should be a deliverables-based project management system	PLM & PDM					
l	Ship development data should be linked to project execution enabling tracking of project status. (Plan vs actual)	PLM & PDM	Yes				
m	System should cover project status on Phases, display Risks, Issues, changes & resource allocations via dashboards and should be configurable.	PLM & PDM					
n	Ability to consume / link the design data /Engineering BOM and create a 3D based Manufacturing BOM structure	PLM & PDM					
o	Ability to integrate and send MBOM structure to ERP System.	PLM & PDM					
p	Ability to create 3D Based Process Planning linking the Manufacturing BOM	PLM & PDM					
q	Ability to add multiple levels of operations / activities detailing the manufacturing steps for sub-assemblies and assemblies	PLM & PDM					
r	System should be able to generate Gantt Chart and run a 3D build up for the process sequence.	PLM & PDM					
s	Ability to Publish the routings and send the same to ERP System whenever required.	PLM & PDM					
t	Ability to author 3D work instructions based /linked to manufacturing process plan	PLM & PDM					
u	System should be capable of publishing the work instructions in html, excel /pdf documents with minimal configuration.	PLM & PDM					
v	Ability to perform 3D virtual build of the process plan.	PLM & PDM					

Annexure-3A

Eol No. EY/D/IT/EOI/04

Scope of Work for Establishing a Design and Engineering center for Design, Planning & Manufacturing (i.e supply of Design Software) in Submarine Construction

Sr. no.	Criteria	Category	Mandatory	YES/NO	Software Name and Version	Module Name	Remarks
w	Ability to create tracks on Manufacturing assemblies to study the design for assembly	PLM & PDM					
x	Ability to create tracks on process plan to study the assembly sequence	PLM & PDM					
53	Hardware recommendations		Yes				
a	Recommendation of Technical Specifications of requisite hardware configuration for workstation and servers to support the software solutions with capability to upgrade.	Hardware recommendations	Yes				
b	Recommendation for Near DR and Far DR Hardware and software with capability to upgrade and upscale	Hardware recommendations	Yes				
54	Other Requirement						
a	Design of mechanical devices along with motion animation, accurate calculations for displacements, velocities, acceleration, reaction forces, flexible body results etc.	Other Requirements	Yes				
b	Integrate systems and controls to simulate mechatronic systems to understand how controls will impact the overall mechanism performance	Other Requirements					
c	Design of mechanical devices along with motion animation.	Other Requirements	Yes				
d	True colour rendering of Platform	Other Requirements	Yes				
e	Walk through animation of platform.	Other Requirements	Yes				
f	Provision of 3D Scanner compatibility to import as is design for modelling and reverse engineering.	Other Requirements					
55	Analysis modules for the following :	Other Requirements					
a	Weapon Systems	Other Requirements	Yes				
b	Radar Cross Section analysis	Other Requirements					
c	Communication systems design (surface and underwater)	Other Requirements	Yes				
d	Analysis of explosions	Other Requirements					
56	Compatilbly with the following softwares :	Software Compatibility					
a	ABAQUS 2012, V6.12-3 and above	Software Compatibility	Yes				
b	Flowmaster V7 version 10.2	Software Compatibility					
c	PARAMARINE ver 2020 update 2	Software Compatibility	Yes				
d	STAR CCM+ 2017	Software Compatibility	Yes				
e	ACT/CUT for Nesting	Software Compatibility					
g	Importability of Aveva Marine Catalogue for library usage	Software Compatibility					
h	Importability of CADD5 Models into environment for subsequent analysis	Software Compatibility					