TENDER SPECIFICATION FOR REFURBISHMENT OF PROPULSION SYSTEM OF BNS TURAG

1. **Preamble.** Necessary refurbishment/ repair/ servicing/ upgradation of the complete propulsion system of BNS TURAG (Ex Island Class Offshore patrol Vessel of British Royal Navy) shall be carried out to rectify the existing defects of the propulsion system.

2. **Components of Propulsion System.** Propulsion system consists of the following components:

a. 02 x RUSTON (Model: 12RK3CM) diesel main engines (ME) including 02 x Engine Control Systems (ECS) and associated peripheral equipment and sensors.

b. 01 x SULZER BROS (UK) Controllable Pitch Propellers (CPP) including 04 x blades for propeller, 01 x shaft, 01 x Oil Distribution (OD) Box and 01 x CPP power unit.

c. 01 x Double input, Single output reduction Gear box.

d. Propulsion Control System (local and remote control) with cabling and wiring interface between and within Bridge Control Console, MCR (Machinery Control Room) Control Station, Engine Rooms, Engine Control System (ECS), and Machinery Control interface.

e. 1 x Shaft Support Systems with 1 x shaft seals, 2 x Plummer blocks, 1 x thrust blocks/bearings,1x stern tubes with bearing and 2 x shaft couplings.

3. **Engine/Machinery/System.** The existing engine/equipment/systems are of following manufacturers:

Equipment	Brand and Model	Country	Year	Manufacturer's Address
ME	RUSTON DIESELS Model: 12RK3CM, 12 Cylinders	UK	1977	Ruston Diesels Ltd, Newton – Le – Willows, Merseyside, England
CPP	Single Screw Controllable Pitch Propeller, IMO Screw B4F-038NI	UK	1977	Sulzer Bros, (UK) Ltd Controllable Pitch Propeller Division Pinehurst Avenue, Farnborough, Hampshire Telephone: (0252) 544311 Telex: 858771
RG	Double input, Single output reduction Gear Box.	UK	1977	Barclay, Curle & Co ltd North British Engine Works Glasgow, UK
Propulsion Control System	**Existing System:** In June 2018, CNRD (BN) developed this system indigenously using a Siemens S7-300 PLC. Later, in January 2019, as the PLC system became inoperative, the vessel has since been operated again using the previous Electro Pneumatic Control System.			**Before 2018 from UK:** Handlec Ltd. Newbury Berks, England. Type: Electro pneumatic.

4. **Existing Defects of the Propulsion System.** The propulsion system including Main Engine (ME), Engine Control System (ECS), Reduction Gear (RG), Controllable Pitch Propeller (CPP) and shafts with support system are to be refurbished/ serviced/repaired for rectification of following defects:

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a. **Main Engine**. The main engines of BNS TURAG are rated for a maximum 750 rpm, but in service they cannot be operated above 560 rpm. When speed exceeds 560 rpm, the fresh water (jacket water) outlet temperature rises to about 79°C which is close to the 85°C limit. Due to the age of the engines, the jacket-water and lube-oil coolers cannot remove enough heat at higher loads. Therefore, to maintain safe operating temperature, engine speed is limited to 560 rpm or below. Besides, the seawater pump, freshwater (jacket-water) pump, gear-type lube-oil pump, intercooler (charge-air cooler), and lube-oil cooler on both main engines have experienced frequent breakdown many times. Additionally, lube-oil and fuel leaks have been observed at multiple locations in the engines. Excessive fuel and lube-oil consumption is also noticed in both engines.

b. **Controllable-Pitch Propeller (CPP)**. The ship-fitted controllable-pitch propeller (CPP) system is very old. As a result, the CPP hydraulic pump, the oil-distribution (OD) box, and the associated hydraulic oil lines show faults frequently. The design maximum pitch angle is 22.35° (ahead) & 20.6° (astern).During operation, most of the times, the CPP system became choked/ locked with air (air-lock), showing faults in reading. Example – at 520 RPM, pitch is 6.2 at bridge but showing 6.0 in MCR, and in OD Box it is showing 4.8.Electric control box is having faults as it cannot starts the standby CPP hydraulic pump.

c. **Propulsion Control and Monitoring System**. Currently, the control and monitoring system is ship fitted and very old, shows fault frequently. The temperature and pressure gauges are aged and often fail. Several sensors are obsolete and showing repeated faults. Digital Exhaust Temperature Monitoring System Sensors (A-3, A-6, DA, FA, FB) are faulty. In June 2018, CNRD (BN) developed this system indigenously using a Siemens S7-300 PLC. Later, in January 2019, as the PLC system became inoperative, the vessel has since been operated again using the previous Electro-Pneumatic Control System. The electro-pneumatic control system (ship-fitted) has recurring problems, including air leaks in the engine control pneumatic lines. The engine speed control card (governor control card) also fails frequently, so we need to adjust the fuel rack to increase the fuel supply.

d. **Reduction Gear**. The Ship is fitted with one reduction gearbox. This gearbox has been in service since the ship was built. Sometimes, control system hydro pneumatic solenoid valve found defective. Currently, to fix the defect permanently, solenoid valve has been brought temporarily from BNS KRT and installed in gearbox.

e. **Shaft with Support System**. The Ship has one shaft. Shaft has two sections; intermediate and tail. The shaft is supported by two Plummer blocks and one Thrust blocks. These supports are very old and consume excessive lubricating oil. Their current performance is satisfactory. However, Plummer Block no-2 has leak in oil seal. Also bearing staves and shaft seals (Model and Type) may need to be renewed for better.

f. **Auxiliary Machineries**. The auxiliary machinery including but not limited to priming pumps, standby pumps, fuel circulating pumps and gear box lub oil pump (GLOP) experiences frequent faults due to age and wear leading to repeated failures and reduced reliability.

5. **Scope of Work/ Supply**. The propulsion system including Main Engine, Propulsion Control and Monitoring System, Reduction Gears, Controllable-Pitch Propeller, Shaft with Support System along with their auxiliaries are to be refurbished/ repaired/ serviced/ upgraded by the respective OEMs for regaining original condition as new one so that the propulsion system can run trouble free for next 12 years. The works under the title **REFURBISHMENT OF THE PROPULSION SYSTEM OF BNS TURAG** will include but not limited to followings:

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a. **Main Engine**. Salient activities/ works of Main Engine (ME) repair are as follows:

(1) The required 30,000-hour overhaul routine for the two main engines of the ship is to be carried out by expert technicians from recognized company as per OEM standard. Details of required maintenance works are listed in Annex A as per OEM maintenance manual. PURCHASER will assist with additional manpower and workshop facility as required under supervision of Bidder's Subject Matter Experts (SMEs).

(2) All prevailing defects as mentioned in para 4(a) are to be rectified.

(3) Both ME's crank shafts are to be inspected for crankshaft deflection and trueness and shall be rectified as per standard requirement. PURCHASER will provide workshop and machine tools support as per availability.

(4) Crank shaft of each of the engines are to be inspected and if necessary to be repaired or refurbished accordingly.

(5) All main bearings, big end bearings, small end bearings and injectors are to be replaced and renewed.

(6) Engine liners, pistons, connecting rods are to be inspected and repaired or renewed as necessary.

(7) All ME auxiliaries such as jacket water pumps, sea water pumps, fuel oil booster pumps, fuel feed pumps, high pressure fuel pumps etc are to be replaced or renewed as necessary.

(8) All ME sub systems (jacket water, fuel, air, and lube oil) are to be inspected thoroughly and all related sensors, meters and gauges (pressure, temperature, speed etc) are to be replaced or renewed. Associated pipelines may be repaired or renewed with their valves and reducers. Necessary workshop support will be provided by BN.

(9) Turbo-super-charger/ Blower (SA-085) fitted with main engines are to be checked for standard performance and trouble-free operation. Turbo blowers are to be repaired with necessary kit and if not possible, to be replaced as necessary.

(10) All other spares parts shall be replaced or renewed as per 30,000hours overhaul routine, OEM standard and based on actual need for smooth operation and full performance of the engines.

(11) All items, auxiliaries and spare parts required for the above repair, refurbishment and renewal works are to be supplied by the BIDDER.

b. **CPP System**. Salient works/ activities of the CPP system repair are as follows:

(1) Salient CPP system is to be thoroughly serviced or refurbished and replaced, as necessary by the expert technicians from the competent company including but not limited to OD box, oil tubes, propeller hub, propeller blades, pumps, filters, pipelines, valves and power pack.

(2) OD Box, Hubs Oil and Tubes are to be completely dismantled and all components are to be inspected and measured for wear and damage, and to be renewed as required. All rubber seals and O rings within the hub and oil tubes must be renewed. All parts of the CPP System

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are to be assembled accurately as per OEM protocol and standard so that CPP system can function without any trouble. Balancing of propeller (static and dynamic) is to be done after necessary work. Workshop support may be taken from BN if available.

(3) Flushing is to be done by BIDDER before final filling of hydraulic oil as per the international standard (NASH). BIDDER will make necessary arrangement for such flushing. BIDDER has to arrange one complete flushing unit and NASH filter unit for achieving required standard. BN will provide only required flashing oil.

(4) All existing defects listed in 4(b) shall be rectified by BIDDER. Any components, special tools and spares required for the rectification and refurbishment of CPP system for correct operation shall be supplied by the BIDDER.

(5) CPP System is to be integrated with newly installed Control System. On completion of the refurbishment work, pitch angle is to be synchronized and calibrated with the Propulsion Monitoring and Control System.

c. **Propulsion Control and Monitoring System.** Salient activities/works of Propulsion Control and Monitoring System (PCMS) are as follows:

(1) The Salient CNRD built (Centre for Naval Research and Development) control system (electrical and pneumatic) is to be replaced and renewed by a PCMS connected to MEs, CPP and Gearbox with full integration for necessary command, control and monitoring facilities.

(2) PCMS should be robust, reliable to allow minimum 10 years trouble free operation. It should be equipped with all required combinatory, sensors, displays, monitors, gauges, pipelines, control valves, solenoids, PCBs, control panels and wiring within it and between PCMS and integrated systems (ME, RG, CPP and necessary auxiliaries). Monitoring options may be kept only in MCR with display.

(3) PCMS should be laid and installed accordingly as to connect Engine Room (for local control), MCR (Primary Control) and Bridge (Secondary Control). Currently it is non-ops since 2019.

(4) A new combinator curve (Pitch–RPM program) shall be designed by BIDDER. The control system shall be designed appropriately as to synchronize main engine's various speeds to appropriate propeller pitch angle so that propeller can generate maximum thrust without overloading the engines.

(5) Necessary drawings or circuit diagrams and manuals are to be provided to the Ship by the BIDDER.

d. **Reduction Gear Box.** Salient activities/works of Reduction Gear Box (RG) are as follows:

(1) Complete inspection and checking of mechanical, pneumatic, and electrical components (in both engaged and disengaged conditions) are to be done by the BIDDER.

(2) Servicing or replacement of all parts of the reduction gearbox, including GLOP, Priming Pump, Clutches and other auxiliaries shall be performed as necessary for the smooth and correct functioning of gearbox by the competent technicians from the recognized company.

(3) All items, auxiliaries and spare parts required for the above repair, and refurbishment works are to be supplied by the BIDDER.

e. **Shaft and Support System.** Salient activities/works of shaft and support system are as follows:

(1) Shaft and shaft support system (all bearings, keys, and couplings) are to be checked for misalignment, wear, damage, run-out, and geometry. Servicing or refurbishment of all such components are to be done by the BIDDER with expert technicians. Shaft trueness may be checked and corrected if necessary and BN will provide workshop facilities. Necessary components, spares and special tools will be provided by the BIDDER.

(2) 2X Plummer block housings, caps, seals, end covers, and bearing inserts are to be opened, cleaned, and inspected. Radial/internal clearance and axial end-float are to be checked. Lubricant condition is to be checked. If necessary or damaged, bearings, seals, sight glasses, and breathers are to be renewed or replaced by BIDDER's technicians.

(3) 1 X Thrust block assembly (pads, collar, carrier, and housing) are to be dismantled and inspected. Pad rocking/pivot freedom, contact pattern, collar wear, and axial end-play are to be checked. If necessary or damaged, thrust components and liners are to be renewed or replaced by BIDDER technicians.

(4) All Couplings are to be opened, coupling bolts and keys are to be removed and are to be inspected and measured for fit, concentricity, and face condition. These are to be serviced or refurbished as necessary by BIDDER technicians. BN can support with additional manpower and lathe machine.

(5) MA and MT bearing shells/pads shall be repaired or renewed and journals to be machined or polished to OEM tolerances.

(6) MA seal elements (lip/face), garter springs, and O-rings/gaskets shall be replaced; the seal liner/sleeve shall be reconditioned or replaced if beyond wear limits, and hoses/pipes and wiper rings shall be renewed.

(7) The two gland-cooling pumps shall be replaced with new units.

(8) Plummer-block and thrust-block, shells, and liners shall be overhauled or replaced as required.

(9) After completing all work, alignment and geometry shall be checked. If required, alignment shall be adjusted and any misalignment shall be corrected by the BIDDER'S technicians.

(10) All necessary special tools including bearing puller and torque multiplier to be supplied by BIDDER. BN may supply only the available tools in Mongla Dockyard workshop.

f. **Setting to Work**. Carrying out setting to work as mentioned in paragraph 26.

g. **Documentations**. An evaluation of propulsion system covering all components and sub systems is to be done by the BIDDER with a detail report prior commencement of the refurbishment work. BIDDER is to submit a report on completion of refurbishment work attaching all records and document related to changes, repair works and modifications. Detail documentation requirement is laid down in paragraph 20.

h. **Training**. Local training in Bangladesh for a group of operators/technicians (15 Personnel) has to be provided for 5 (Five) working days. The training will be conducted by competent foreign engineers/technicians after installation is completed (before/during HAT and SAT). Training should cover both practical and classroom session and should encompass whole propulsion systems (ME, gearbox, CPP, PCMS and Shaft Support System focusing operation, maintenance, and troubleshooting. Necessary training handout to be provided by the BIDDER.

j. **Software and Backup**. Necessary software (genuine and full version) with back up is to be provided by BIDDER on completion of work and during the training session. Software part is to be included in the training as well. Required updates of backup software are to be provided by the BIDDER for next 10 years without additional cost.

6. **Project Schedule/ Delivery Time.** Project Schedule/ Delivery Time will be as follows:

a. The BIDDER must complete the project within 12 (Twelve) months from the date of signing the contract including HAT and SAT. The actual onboard work period shall be coordinated between BIDDER and NHQ so that the ship remains non-operational for a short period of time only.

b. The BIDDER shall submit a complete project schedule covering initial evaluation, shipment of spares, repair/up-gradation works, docking period and test/trials in the offer. The sequence of repair work should be carefully planned as to affect the operational period, ships activities and other repair work to the minimum. Applicable logical and technical sequence should also be followed in consultation with the NHQ. Details may be discussed during pre-bid meeting.

7. **Spares Required.** The BIDDER should offer/supply all necessary spares required to complete the scope of work/supply mentioned in Paragraph 5 with itemized prices. If any spares mentioned for scope of works are not consumed during the servicing, it will be handed over as BN/Ship on completion of the project with a complete list and pattern number. If the spares from BN stock is used, the BN store is to be replenished by the BIDDER.

8. **Special Tools.** BN Dockyard/ Mongla Dockyard/ the Ship will provide available tools for the project works. The BIDDER will arrange all the special tools, if not held at BN Dockyard/ Mongla Dockyard/ Ship for the project work. The special tools are to be handed over to BN/Ship on completion of the works. The BIDDER, where necessary, may conduct survey to ascertain existing BN facilities at their own cost.

9. **Eligibility of the BIDDER.** The BIDDER shall be competent and experienced in similar repair/ refurbishment work onboard ship. The BDDER shall be any of the followings:

a. OEM of any of the systems (within the scope of works), or

b. Any reputed company who is competent and experienced in similar repair/ refurbishment work onboard ship, or

c. A reputed company who is authorized by OEMs of the systems (within the scope of works) or authorized by any reputed company who is competent and experienced in similar repair/ refurbishment work onboard ship.

10. **Eligibility of Technicians.** All technicians should be skilled and from the well-known relevant work field. The Technician should also be led and guided by subject matter expert (SME). The credentials, travel itinerary, passport, bio-data and other relevant documents including VISA of the technicians are to be submitted prior 01 (one) month of commencement of the actual works for approval of the PURCHASER. After vetting necessary credentials and security clearance from concerned authority, The PURCHASER will notify the BIDDER about clearance of the technicians visit.

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11. **Overall Coordination among the Multiple Work Groups.** The project may involve different experts from different countries/ companies. Their individual scope of work may be unique and different as well. Despite this difference, they will work simultaneously on the same platform to achieve the common objective i.e., repair/refurbishment work of propulsion system of the ship. For this mutual cooperation, coordination, information sharing, resource sharing etc. BIDDER or local agent on his behalf is to act as overall coordinator for such purpose.

12. **Supervision of Works**. The repair/refurbishment of propulsion system shall be done by the BIDDER'S technicians in presence of Ship and BN Dockyard personnel. The BIDDER shall deploy required number of expert technicians for successful completion of the project. The BIDDER is to appoint a competent **'Project Manager/ Supervisor'** on his behalf for supervising and coordinating all project works on site at BIDDER's arrangement. The Project Manager/Supervisor shall carry out survey of the Ship and Dockyard facilities within 01 (one) month of signing the contract. Project Manager/Supervisor shall be on site for total duration for which the actual work take place on site.

13. **Support from BN Dockyard/ Mongla Dockyard**. All administrative, logistic and transport facilities for the work on site are to be provided by the BIDDER. BN will provide available crane and forklift support within the naval premises. All repair/maintenance/installation materials, cablings, spares, tool set are to be provided by the BIDDER. BIDDER may use general workshop facilities available BN Dockyard/ Mongla Dockyard. BIDDER may mention supports necessary from BN Dockyard/ Mongla Dockyard in the offer. Ship will be docked under the arrangement of BN and cost will be borne by BN.

14. **Test, Trial and Acceptance.** Test and Trial and Acceptance will be carried out as follows:

a. Test and trials (HAT & SAT) of the Propulsion System is to be done by the BIDDER in the presence of BN representative/Acceptance Committee on completion of work. The BIDDER is to submit detailed HAT and SAT procedure at least 02 (Two) months before the commencement of test/trails to NHQ for approval. HAT and SAT procedure are to include condition of test/trial, test procedure and desired standard parameters for the test covering all sub systems of the propulsion system. The procedure will be finalized after incorporating the NHQ's comments. Following tests must be included in the HAT/SAT procedure:

(1) Both main engines should be tested for correct running parameters at harbour after maintenance.

(2) Both main engines shall be engaged with the gearbox and run at their maximum rated RPM. All parameters shall remain within their allowable limits while the engines are operating at maximum rated RPM (750 RPM).

(3) Both main engines should be operated at sea with maximum output for reasonable period of time to measure running parameters in full load condition. Engine BHP to be measured by the BIDDER at full load condition with suitable measuring device (measuring the torque). Minimum allowable BHP is 95% of maximum continuous rated power 2190 hp for each engine.

(4) Both main engines shall be operated for a reasonable period to verify that known issues have been rectified specifically; the inability to reach the rated maximum RPM, any parameters exceeding allowable limits, the exhaust "red hot" condition, and the CPP pitch angle problem mentioned in paragraph 4 to confirm that none of these issues persist.

(5) Turbo blower and governor performance is to be inspected, compared and recorded for correct functioning.

(6) Stock of spares held onboard and supplied by the BIDDER are to be inspected, compared and listed.

(7) CPP performance should be monitored and recorded for proper functioning of each component and cross checked with the ship's speed table.

(8) RG/ Gearbox performance is to be checked, monitored and recorded for correct functioning.

(9) Propulsion Control and Monitoring System are to be tested for correct calibration and functioning.

(10) All replaced/renewed/repaired sensors are to be checked for correct functioning.

b. Operating tests and performance checks for propulsion system should also include:

(1) Progressive Speed Trial (Ahead, Astern) with full power trial.

(2) ME starting & control air system check.

(3) Operating Test for propulsion shaft seal and bearing.

(4) Integrated Operating Test for propulsion system.

(5) Operating Test for CPP at sea.

(6) Zero Pitch Test for CPP at sea.

(7) Ship's Endurance Test.

(8) Fuel Oil Consumption Test.

(9) Analog and digital parameters synchronization of complete propulsion system.

c. **Desired Parameters.** Considering existing operational conditions of the ship, followings are the desired parameters after completion of the repair/ refurbishment work:

Criteria	Desired Parameter
Speed at maximum continuous rating (at 750 rpm) (Allowable limit 95%)	14.5 knots at 1220 tons displacement
Endurance	Not less than 4000 NM 12 knot speed

d. After satisfactory test & trial (HAT/SAT), an Acceptance Certificate shall be provided by the BN/Ship/Acceptance Committee.

e. Necessary arrangements for SAT at sea shall be done by the BN/Ship. The BIDDER shall supervise accordingly. BIDDER is to arrange the presence and supervision of experts of each subsystem during HAT and SAT.

15. **Insufficient Speed and Power.** Speed guarantee and continuous includes the followings:

a. The BIDDER shall have to give guarantee that the repair/refurbishment will enable the ship to achieve the desired maximum continuous speed 14.5 knots (at 1220 ton load condition) and 95% of 2190 hp for each engine.

b. In case, the ship fails to achieve the maximum speed and power as stated in the specification then penalties shall be imposed on the BIDDER for non compliance of the contract as per the following:

Ser	Speed Deviation from the Desired Speed	Penalty Counted in % of LC value
1.	Upto 0.25knots	1.25%
2.	0.25 to 0.50knots	2.5%
3.	0.50to 0.75knots	3.75%
4.	0.75to 1.0knots	5%
5.	1.0 to 1.25knots	6.25%
6.	1.25 to 1.50knots	7.5%
7.	1.50 to 1.75knots	8.75%
8.	1.75 to 2.0 knots	10%

c. If the deficiency in actual maximum continuous speed of the ship is more than 2 (two) full knots below the speed guaranteed in the Contract, then BN, at its option, may, subject to the BIDDER'S right to effect alternations or corrections, cancel the Contract.

16. **On-site Inspection.** The BIDDER may inspect the Ship to assess the existing operational state of the ship before submitting their offer at BIDDER'S own cost.

17. **Warranty.** The BIDDER shall provide warranty period of minimum 01 (one) year after signing final acceptance by Acceptance Committee. During warranty period, all necessary service/repair of the propulsion system are to be done by BIDDER without any charge/payment. If any defect arises within these two years, BIDDER will rectify the defect by replacing the respective module. If the equipment remains non-operational for more than 03 (three) months (date count from the date of initial reporting to BIDDER or local agent) due to defect in any sub unit/component during the warranty period, the warranty period will further be extended for that period.

18. **Guarantee for Warranty.** The BIDDER shall furnish to DGDP a bank guarantee for warranty amounting 5% (Five percent) of the LC value after satisfactory test/trial (HAT/SAT), local training and acceptance by BN which shall remain valid until expiry date of the warranty period.

19. **Certificate.** The BIDDER is to furnish following certificates:

a. Guarantee Certificate.
b. Warranty Certificate.
c. In case, BIDDER himself is not accomplishing the repair or refurbishment work, necessary authorization certificate or proof of partnership from the company/ OEM/ organization doing the refurbishment/repair work are to be submitted with the tender.

20. **List of Documents.** Documents are to be submitted by the BIDDER in both hard and soft copies. The list of documents is:

a. Evaluation report on propulsion system and work plan before commencement of the work.
b. Complete report on the refurbishment work with necessary information, data and records.
c. Complete wiring diagram, installation diagram and operating manual of the control system.
d. HAT & SAT procedure document (before 2 months of test/trial).
e. Parts Catalogue for newly installed components.
f. All relevant certificates as mentioned in this document.
g. Final acceptance certificate.

21. **Shipment and Delivery**. Shipment and delivery to be carried out as follows:

a. The BIDDER is to arrange shipment of all items by sea/air to Chattogram as per the scheduled timeline to the following address:

The Commanding Officer,
Naval Stores Depot, New Mooring,
Chattogram, Bangladesh.

b. All items are to be delivered in suitable protective packing to ensure safe transit.

c. All packages are to have packing notes showing their contents in detail and all packages shall be marked with the name and address of the consignee and gross weight.

d. BN will assist in completing custom formalities. The BIDDER will arrange transportation of all supplied items to NSD Chittagong.

e. **Port of Shipment**. Any port of the manufacturing country.

22. **Price Quotation.** The BIDDER is to offer full itemised price for supplies, spares, services and training for each of the components of the propulsion system. The PURCHASER will have the right to procure particular supplies, spares, services and training from the offered price quotation depending on actual requirements and OEM recommendations.

23. **Price.** If the item is imported against this order, price to be quoted without import duties.

24. **Terms of Payment.** Letter of Credit (LC) shall be opened for full amount of contract price in favor of BIDDER for the complete scope of supply with the following terms of payment:

a. 20% (Twenty percent) of total LC value will be paid on submission of the documents mentioned in Paragraph 20a (Evaluation Report and Work Plan) and on submission of a Bank Guarantee (BG) provided by the BIDDER amounting 20% (Twenty percent) of the LC value issued by any scheduled bank of Bangladesh. BG will be released prior payment of next installment (40%).

b. 40% (Forty percent) of total LC value will be paid on delivery of new PCMS, spare and tools, ME overhauling spares, new CPP control system and other relevant major components to the consignee

c. 20% (twenty percent) of total LC value will be paid on completion of all repair/refurbishment work under the scope of work/supply and carrying out setting to work (as per paragraph 25).

d. 20% (Twenty percent) of total LC value will be paid after satisfactory test/trial (HAT/SAT), local training and acceptance by BN and on submission a bank Guarantee for Warranty amounting 5% (Five percent) of the LC value issued by any scheduled bank of Bangladesh. The Guarantee and warranty shall remain valid until expiry date of the warranty period.

25. **Setting to Work.** Shall mean the following:

a. **Propulsion Control& Monitoring System.** The system should be ready to operate the propulsion system satisfactory after necessary repair/ replacement/ refurbishment. Necessary functional test is to be carryout and system is to be made fully operational.

b. **Main Engines (ME).** Running In is to be carried out by operating engine at different rpm. The engine should be ready for on load test/trial (HAT/SAT).

c. **Controllable Pitch Propeller (CPP).** Functional test at different pitch is to be carried out and ready for test/trial.

d. **Reduction Gearbox (RG).** Fully functional and ready for on load test/trial.

26. **Validity of the Offer.** The offer shall remain valid up to **June 2026**.

27. **Compliance Statement.** A clear and complete compliance statement of the tender specification supported by brochure/ booklet, etc in English is to be submitted with the offer. Any deviation from this specification is also to be clearly mentioned in the offer. Incomplete compliance statement may attribute to cancellation of the offer.

28. **Condition for Acceptance of Quotation.** Quotation may not be considered if detailed information/specifications, maker's brochures/booklet of offered item, accessories and scope of supply/work etc are not provided. The PURCHASER may purchase part or whole of the consumables/accessories/test equipment.

Enclosure:

A. Main Engine 30,000 hour's Scheduled Maintenance.
B. List of Pumps/Accessories.
C. Shaft Layout Drawing.

MAIN ENGINE		
MAINTENANCE SCHEDULE		
Maint Op No	**JIC/ User No**	**Job Description**
30000 Hrs (Major overhauling)		
1.	$30000H_1$	Engine to be completely taken apart and carried out overhauling its associated parts accordingly.
2.	$30000H_2$	Examine the main bearing shells and determine the bearing clearances. Clean the bedplate. Inspect the main bearing bolt lower nuts and split pins before reassembly.
3.	$30000H_4$	Inspect the crankshaft for cracks; check the journals for wear and ovality. Clean and flush the oil ways. Check the crankshaft alignment when the engine is reassembled.
4.	$30000H_4$	Withdraw the balance shaft (8v engine) after checking the backlash in the gears. Calibrate the bearing clearance and end floats. Dismantle the balance weight and idler gear; inspect and calibrate.
5.	$30000H_5$	Flush through oil ways in the hubs.
6.	$30000H_6$	Clean, de-scale the crankcase.
7.	$30000H_7$	Remove and clean the cylinder liners, check the bores and renew the sealing rings.
8.	$30000H_8$	Dismantle the auxiliary drive and check the bearing clearance.
9.	$30000H_9$	Dismantle and inspect the oil and water pumps.
10.	$30000H_{10}$	Examine camshaft gears, shafts and bushes. Remove camshafts and check journals, couplings and bushes. Check running clearances.
11.	$30000H_{11}$	Fit new parts as necessary.
12.	$30000H_{12}$	Examine and lubricate the motor-driven speeder gear.
13.	$30000H_{13}$	Dismantle the over speed trip. Clean all parts and check for damage and/or wear. Renew parts as necessary.
14.	$30000H_{14}$	Renew big-end bearings and big-end bolts, nuts and washers.
15.	$30000H_{15}$	Check the fuel transfer pump and drive. Clean all parts and discard the oil seal. Renew any parts which are damaged
16.	$30000H_{16}$	Clean out the bedplate lubricating oil suction pipes and strainer; renew all synthetic rubber hose connections and joints which have been disturbed.
17.	$30000H_{17}$	Descale the engine water spaces.
18.	$30000H_{18}$	Clean the air and water sides of the charge cooler. Clean the oil and water sides of the lubricating oil cooler. Clean the fresh and sea water sides of the heat exchanger. Renew all joints and hoses

Equipment Description: Main Engine (Model- 12RKCM), Diesel Engine | Schedule Number E-101

Schedule Title: 30000 Hours

Enclosure B

LIST OF PUMP ACCESSORIES OF MAIN ENGINE BNS TURAG

MAIN ENGINE:

1. Exhaust Manifold.
2. F/W pump.
3. S/W pump.
4. Lub oil pump.
5. Lub oil cooler.
6. F/W cooler.
7. Turbo super charger.
8. Fuel feed pump.

GEAR BOX:

1. Gear box standby pump.
2. Gear box cooler.

CPP:

1. CPP hydraulic oil pump.
2. OD Box.
3. CPP hydraulic oil cooler.

PROPULSION:

1. Gland cooling pump.
2. Deep Sea Seal.

MANIFOLD EXHAUST:

Ser	Particulars	Description
1.	Name of Item	Manifold Exhaust
2.	Name of Main Equipment	Main Engine
3.	Quantity	08 (Left Side: 04, Right Side:04) Both Engine
4.	Equipment Brand	Ruston
5.	Equipment Model	12RK3CM
6.	Equipment Serial no	IH-3459
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Ruston Diesel (UK) Ltd
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

FRESH WATER PUMP:

Ser	Particulars	Description
1.	Name of Item	Fresh water pump
2.	Name of Main Equipment	Main Engine
3.	Quantity	01
4.	Equipment Brand	Ruston
5.	Equipment Model	12RK3CM
6.	Equipment Serial no	IH-3459
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Ruston Diesel (UK) Ltd
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

SEA WATER PUMP:

Ser	Particulars	Description
1.	Name of Item	Sea Water Pump
2.	Name of Main Equipment	Main Engine
3.	Quantity	01
4.	Equipment Brand	Ruston
5.	Equipment Model	12RK3CM
6.	Equipment Serial no	IH-3459
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Ruston Diesel (UK) Ltd
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

LUB OIL PUMP:

Ser	Particulars	Description
1.	Name of Item	Lub Oil Pump
2.	Name of Main Equipment	Main Engine
3.	Quantity	02
4.	Equipment Brand	Ruston
5.	Equipment Model	12RK3CM
6.	Equipment Serial no	IH-3459
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Ruston Diesel (UK) Ltd
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

LUB OIL COOLER:

Ser	Particulars	Description
1.	Name of Item	Lub Oil Cooler
2.	Name of Main Equipment	Main Engine
3.	Quantity	01
4.	Equipment Brand	Ruston
5.	Equipment Model	12RK3CM
6.	Equipment Serial no	IH-3459
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Ruston Diesel (UK) Ltd
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

FRESH WATER COOLER:

Ser	Particulars	Description
1.	Name of Item	Fresh Water Cooler
2.	Name of Main Equipment	Main Engine
3.	Quantity	02
4.	Equipment Brand	Ruston
5.	Equipment Model	12RK3CM
6.	Equipment Serial no	IH-3459
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Ruston Diesel (UK) Ltd
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

TURBO SUPER CHARGER:

Ser	Particulars	Description
1.	Name of Item	Turbo Super Charger
2.	Name of Main Equipment	Main Engine
3.	Quantity	02
4.	Equipment Brand	Ruston
5.	Equipment Model	12RK3CM
6.	Equipment Serial no	IH-3459
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Ruston Diesel (UK) Ltd
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

FUEL FEED PUMP:

Ser	Particulars	Description
1.	Name of Item	Fuel Feed Pump
2.	Name of Main Equipment	Main Engine
3.	Quantity	02
4.	Equipment Brand	Ruston
5.	Equipment Model	12RK3CM
6.	Equipment Serial no	IH-3459
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Ruston Diesel (UK) Ltd
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

FUEL HIGH PRESSURE PUMP:

Ser	Particulars	Description
1.	Name of Item	Fuel High Pressure Pump
2.	Name of Main Equipment	Main Engine
3.	Quantity	24
4.	Equipment Brand	Ruston
5.	Equipment Model	12RK3CM
6.	Equipment Serial no	IH-3459
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Ruston Diesel (UK) Ltd
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

GEAR BOX LUBRACATING PUMP:

~~Ser~~	~~Particulars~~	~~Description~~
1.	Name of Item	Gear Box Lubricating Pump
2.	Name of Main Equipment	Main Gear Box
3.	Quantity	01 Each Engine
4.	Equipment ~~Brand~~/Type	TRIRO
5.	Equipment Model	
6.	Equipment Serial no	-
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	MIRLEES Pump Ltd, UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	MIRLEES Pump Ltd, Newbury, UK
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

GEAR BOX COOLER:

Ser	Particulars	Description
1.	Name of Item	Gear Box Cooler
2.	Name of Main Equipment	Main Gear Box
3.	Quantity	02
4.	Equipment Brand	Barclay
5.	Equipment Model	
6.	Equipment Serial no	-
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	Barclay Curle & Co Ltd. UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Barclay Curle & Co Ltd.
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

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CPP HYDRAULIC OIL PUMP:

Ser	Particulars	Description
1.	Name of Item	CPP Hydraulic Oil Pump
2.	Name of Main Equipment	CPP
3.	Quantity	02
4.	Equipment ~~Brand~~/Type	ALA45 - 4LNSEHH OIL SCREW PUMP
5.	Equipment Model	ALA45 - 4LNSEHH
6.	Equipment Serial no	-
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	Sulzer Bros (UK) Ltd
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Sulzer Bros (UK) Ltd
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

CPP HYDRAULIC OIL COOLER:

Ser	Particulars	Description
1.	Name of Item	Hydraulic Oil Cooler
2.	Name of Main Equipment	CPP
3.	Quantity	01
4.	Equipment Brand	-
5.	Equipment Model	BOXMAN FC-140-3126-4
6.	Equipment Serial no	-
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	BIRMINHAM,UK
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	BIRMINHAM,UK
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

OIL DISTRIBUTION BOX:

Ser	Particulars	Description
1.	Name of Item	Oil Distribution Box
2.	Name of Main Equipment	OD Box
3.	Quantity	01
4.	Equipment Brand	Sulzer Bros
5.	Equipment Model	
6.	Equipment Serial no	-
7.	Country of Origin (Main Equipment)	UK
8.	Country of Manufacture	Sulzer Bros (UK) Ltd
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Sulzer Bros Ltd. Farn Borough, UK
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A

DEEP SEA SEAL:

Ser	Particulars	Description
1.	Name of Item	Deep Sea Seal
2.	Name of Main Equipment	Propulsion System
3.	Quantity	02
4.	Equipment Brand	-
5.	Equipment Model	-
6.	Equipment Serial no	-
7.	Country of Origin (Main Equipment)	Germany.
8.	Country of Manufacture	Germany.
9.	Year of Manufacture (Spares)	2024 or later
10.	Source of Supply	OEM
11.	Port of Shipment	N/A
12.	Manufacture's Name and Address	Simplex Turbulo Marine Co Ltd. howaldtswerke-Deutschewerft. Aktiengesellsch aft, Hamburg, Germany. P.o.box 111480 Tel.(040) 7411 Telex.217603/21763
13.	Supplier/Local Agent	To be mentioned
14.	Certificate and Document of Authentication	OEM Certificate
15.	Packing/labeling	To be mentioned
16.	Warranty	At least 12 months from date of acceptance.
17.	Installation/Compatibility/Interfacing	N/A
18.	Test, Trial and acceptance	N/A
19.	Site visit (Focal Point)	N/A


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তারিখ.....
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