TENDER SPECIFICATION OF AIR CONDITIONING PLANT (CAPACITY: 65 TON)

1. **Name of the Equipment.** Portable Air conditioning plant.

2. **Purpose**. The air conditioning plant will be used onboard pontoon for providing cool air/conditioned air to submarines.

3. **Operational Requirements**. The Air conditioning plant is to provide conditioned air by simultaneous control of air temperature, humidity, purity and pressure to meet the requirements of the conditioned space. It should be able to cool the internal accommodation, office space, equipment room and other working spaces of submarine by supplying conditioned air through flexible and insulated aluminium foil air duct that passes through the hatches of a submarine. The air conditioning unit shall be self-contained air-cooled with all-weather enclosure of ample capacity to meet the indoor requirements under adverse weather conditions and suitable automatic operation. The unit along with accessories is to be factory-assembled, tested and housed as a single unit so that it can be lifted, shifted and positioned for the purpose of placing the same to any other places of Bangladesh.

4. **Quantity**. One (01) complete set of air cooled and skid mounted AC Plant.

5. **Manufacturer, Principal Supplier & Local Agent**. Names and full address are to be mentioned in the following table.

Ser	Description	Remarks
a.	Brand/Manufacturer	To be mentioned
b.	Principal Supplier	To be mentioned
c.	Local Agent	To be mentioned

6. **Year of Manufacture**. 2025 or later.

7. **Country of Origin**. USA, UK, Canada, EU Countries and South Korea.

8. **Manufacturing Country**. USA, UK, Canada, EU Countries and South Korea.

9. **Certificate/ Document of Authentication**. The local agent must provide following original certificate(s)/ document(s) with the offer/ quotation of items as regard to the gentility of source and item(s) in order to establish chain of links from the original source to supply items:

a. One certificate/ document by the manufacturer in favour of the supplier (in case of manufacturer as direct source).

b. Two certificates/ documents, one by the manufacturer to authorized agent and other by the authorized agent to supplier (in case of authorized agent as immediate source).

c. Three certificates/ documents, first one by manufacturer to authorized agent, second one by authorized agent to sub-agent and third one by sub-agent to supplier (in case sub-agent as immediate source). If the supplier is unable to obtain the first certificate (by manufacturer to authorized agent), then it has to produce relevant document to prove agency-ship of its claimed agent of the recognized manufacturer.

10. **Basis of Design/ Design Criteria**.

a. **Outdoor Design/ Combined Conditions**. Based on climatologically data of Bangladesh, the ambient conditions as follows:

(1)	Outside Air Temperature	5°C ~ 52°C
(2)	Relative Humidity (RH)	Up to 98%
(3)	Water Condition	Salty and muddy.

b. **Indoor Design Conditions**. Indoor design conditions for air conditioned spaces of submarine shall be:

(1)	Dry Bulb Temperature	24°C
(2)	Relative Humidity (RH)	50%

11. **Duty Cycle/ Nature of Duty**. 24 hours operation per day.

12. **Electrical Power Supply**. All machinery/ equipment of the AC Plant should be able to run the shore supply of 370~425 V, 50Hz±2.5%, 3 Phase (AC supply). The supplier shall specify the total power requirements at full load operation of the air conditioning plant. System should include all protection devices/ controls to withstand fluctuation/ variation in power supply. The input power supply tolerance of compressors and associated motors of the plant should be within ±10% of the rated electric supply.

13. **Record of Sales**. Record of sales of the quoted model of the AC Plants with name of the customers in the preceding three years is to be included with the quotation.

14. **General Standard**. The design, manufacturer and testing of the AC Plant shall **conform** to the relevant ASHRAE standard or any other recognised international standard. The plant shall be of the latest design incorporating features, which guarantee reliable service, convenient and safe operation and shall be produced to the highest standard of workmanship using best quality materials. The manufacturing of parts shall be such that interchange abilities of wearing parts are assured and the spare parts are available in the market. The AC Plant of adequate capacity shall be self-contained, air cooled and skid mounted package unit. The plant shall be equipped with HP/LP control, low/high voltage/signal phasing prevent, overloading and safety device necessary for the trouble free operation of the plant including all cables and accessories.

15. **Scope of Supply**. The scope of supply is to include the followings:

a. Main items (One complete set of air cooled and skid mounted Portable AC Plant), complete with all items necessary for immediate operation without the requirement of any other items (attachments, accessories, consumables, etc) (as per paragraphs 16 to 18).

b. Optional items (as per paragraph 19).

c. Standard tools (as per paragraph 20).

d. Spare parts (as per paragraph 21).

e. Documents (User Manual, Maintenance Manual, Spare Parts Catalogue, Drawings etc; as applicable) and Certificates (as per paragraphs 22 and 23).

f. Factory Acceptance Test (FAT) (as per paragraph 24).

g. Installation and installation material (as per paragraph 25 and 26).

h. Test/Trial, Commissioning (as per paragraph 27).

j. Training (as per paragraph 28).

k. Warranty and Guarantee (as per paragraph 29 and 30).

l. Any other items necessary for immediate operation.

16. **Technical Specification.**

a. **Compressor.** The compressor shall be of the high efficiency complaint scroll design with and E.E.R. (Energy Efficiency Ratio) of not less than 3.25 at ARI rating conditions. The compressor shall be charged with mineral oil and designed for operation with eco-friendly refrigerants that are available in Bangladesh. At least two (02) compressors (each compressor capable of handling the total cooling load of the plant independently) are to be provided with the plant. Each compressor shall have internal motor protection and be mounted on vibration isolators. The compressors shall be hermetically sealed screw type, with enclosed gas cooled motor. The AC Plant should be equipped with variable speed screw compressors type module for power saving based on inverter driven technology. Fixed speed compressor will not be acceptable for any reason. Besides, compressor shall be provided with the following safety controls:

(1) High discharge Pressure (HP) safety (cut out) to stop the compressor automatically.

(2) Low suction Pressure (LP) safety (cut out) to stop the compressor automatically.

(3) Oil Pressure (OP) safety (cut-out) to stop the compressor.

(4) Manual reset high and low pressure cut out.

(5) Manual high and low oil pressure cut out.

The specification of compressor and motor are given below:

(a) **Compressor.**

Ser	Parameters	Requirements
1.	Type	Semi hermetic screw type
2.	Model	To be mentioned
3.	Manufacturer	To be mentioned
4.	Number of compressor (at least two)	02
5.	Refrigerant	To be mentioned
6.	No of stage	02
7.	Type of capacity control	To be mentioned
8.	Capacity control range	To be mentioned
9.	Type/ method of lubrication	To be mentioned
10.	Grade of lubrication oil	To be mentioned
11.	Overall dimension of the AC Plant	To be mentioned
12.	Operating weight (kg)	To be mentioned
13.	Method of capacity control	Mechanical

(b) **Motor.**

Ser	Parameters	Requirements
1.	Type	Marine type, squirrel cage induction motor
2.	Model	To be mentioned
3.	Make	To be mentioned
4.	Rated output (kW)	400-415±10
5.	Working voltage range (V)	To be mentioned
6.	Type of bearings	To be mentioned

7.	Type of enclosure	To be mentioned
8.	Class of insulation	F
9.	Rated speed (rpm)	To be mentioned
10.	Rated frequency	50Hz
11.	No of phases	3 phases
12.	Full load current (amps)	To be mentioned
13.	Starting current (amps)	To be mentioned
14.	Efficiency at 100%, 75%, 50%, 25% of rated full load	To be mentioned
15.	Power factor at 100%, 75%, 50%, 25% of rated full load	To be mentioned

(c) **Motor Starter.**

Ser	Parameters	Requirements
1.	Manufacturer	To be mentioned
2.	Type	To be mentioned
3.	Rating	To be mentioned
4.	Protections	Over load, under voltage and single phase protection (for 3 phase motor starter) to be provided

b. **Condensing Unit.** The condenser shall be air- cooled with multiple speeds condenser fans and should consist of copper tubes and aluminium fins. The condenser coils shall be of adequate size and shall have an integral sub cooler circuit for sub cooling of the liquid. Condenser coil shall have a refrigerant side working pressure of 400 psi with anti-corrosive treatment. Condenser shall have multiple piping and cabling connection option. Pump down facility should be provided in the refrigerant system by providing good quality hand/ shut off valves to avoid loss of refrigerant gas during maintenance. The condenser fans shall be propeller type, with aluminium blades, low speed and low vibration levels and quite in operation with IP 55 protection. "Anti - Corrosive" treatment (Blue Fins) for Al fins of condenser coils is mandatory and shall carry warranty of at least five (05) years. The treatment should be suitable for areas of high pollution and salt laden air. The air quantity and area of the condenser shall be adequate for working in the specified out- door conditions. Refrigerant control in the plant shall be through Electronic Expansion Valve. Complete refrigerant circuit, oil balancing/ equalizing circuit shall be factory assembled and tested. The safety control for a condenser shall comprise a safety pressure relief valve that should operate to relieve the pressure at set point without prior leakage. Specification of the condenser are as follows:

Ser	Parameters	Requirements
a.	Manufacturer	To be mentioned
b.	Type	Air cooled
c.	Tube material	Cu/Ai
d.	Capacity	To be mentioned
e.	Pressure relief vavle	To be fitted
f.	Air flow rate (m^3/hr)	To be mentioned
g.	Air inlet temperature	45^0C
h.	Air outlet temperature	55^0C

(Note: condenser is air cooled).

c. **Evaporator Coil.** The evaporator coil shall be A- shape coil (for down flow) incorporating draw - through air design for uniform air distribution. The specification of the evaporator are as follow:

Ser	Parameters	Requirements
a.	Maker	To be mentioned
b.	Supply air quantity	To be mentioned
c.	Cooling capacity	65 ton (230 kW)
d.	Evaporator outlet air temperature	To be mentioned
e.	Cooling coils are to be made of refrigerant grade copper tubes with aluminium fins and must be resistant against corrosion	

d. **Fan Section.** The fan is to be fitted inside the air handing unit (AHU) casing and should generate sufficient pressure to overcome the system resistance and other additional losses. so that each specified of the evaporated are as follows:

Ser	Parameters	Requirements
a.	Type/model	To be mentioned
b.	Capacity (m^3/hr)	To be mentioned
c.	Blower speed	To be mentioned
d.	Power of drive motor	To be mentioned
e.	RPM of drive motor	To be mentioned
f.	Available power supply	3Phase, 380V, 50Hz
g.	Protection	IP 54 or better
h.	Insulation class	F

e. **Piping for refrigerant**. Piping for refrigerant liquid line, hot gas line and all fittings in the piping should be of standard material for such purpose and must be easily replaceable/removable for repair/servicing with the following fittings:

Ser	Parameters	Requirements
a.	Evaporator refrigerant isolation valves	To be mentioned
b.	Filter drier with isolation valves	To be mentioned
c.	Liquid solenoid valve to allow pump down of system during automatic operation.	To be mentioned
d.	Sight glass	To be mentioned
e.	Thermal expansion valve	To be mentioned

f. **Charging Connection/Adaptor.** Each plant will be provided with facility for charging refrigerant in to the system with as set of male-female connectors/adaptors connected through a line (re-enforced, flexible and transparent) of the internationally acceptable standards.

g. **Filtration.** The filter chamber comprising of washable synthetic woven filters shall be an integral part of the system. The filter should be of 5 micron filtration capacity & efficiency level should be above 90%.

h. **Ventilation System.** All fans shall be static and dynamically balanced. The fans shall be selected for heavy-duty operation. The fan impeller shall be propeller type. The motor shall be flame proof and totally enclosed type, with capacitor start and run type motor, rated for continuous duty and rugged in construction. The motor shall have pre-lubricated double ball bearing and shall be provided with class A/E insulation.

j. **Vibration and Noise Control**. The design, construction and workmanship shall be such to achieve vibration level at the minimum and the noise level should not be more than 35 to 40 Decibles when the plant is operating at maximum capacity.

k. **Charging Connector/ Adaptor.** Each AC Plant should be provided with facility for charging refrigerant into the system with a set of male-female connectors/adaptors connected through a line (re-enforced, flexible and transparent) of internationally acceptable standards.

l. **Painting.** The unit should be finished with two coats of enamel paint of good and approved quality.

m. **Flexible and Insulated Air Duct.** The conditioned air will be distributed to the submarine by the insulated air ducting. The evaporating unit shall be connected to air ducting by means of flexible connections of canvas type with zip of necessary. The evaporator outlet should have 4 connection points/pipes for connecting various air ducts. Good quality Flexible and Insulated Aluminium Foil Air Duct with associated accessories and fitting arrangements are to be provided as per following specifications:

Ser	Parameters	Requirements
1.	Product name	Flexible dual layer Aluminium foil air duct with insulation
2.	Kind	Double-Sided
3.	Material	
	(a) Wall	Glass fibre bonded with Aluminium foil
	(b) Helix	Steel wire
4.	Usage	Transfer of cold air from AC Plants to Submarine
5.	Colour	Silver/ Gold
6.	Shape	Round
7.	Size (diameter)	To be commensurating with the diameter of connecting pipe from evaporator
8.	Length of Air Ducts	10 x 20 mtr (with connector)
9.	Feature	(a) Highly flexible and compressible. (b) Flame resistant. (c) Heat resistant. (d) Corrosion resistant. (e) Small bending radius. (f) Easy to install.
10.	Outlet connection point	04

17. **Lifting Facilities.** The AC Plant should have lifting facilities with necessary eyebolts and slings on the top of the plant.

18. **Standard Accessories**. Standard accessories must include all items and accessories essential to operating the AC Plant, whether mentioned in the specification or not. The price of standard accessories is to be included in the FOB value. However, an itemised price list of standard accessories is to be provided with the offer for reference value only.

19. **Optional Items**. A list of optional items (if any) for AC Plant is to be mentioned, indicating the itemised price. Technical details of these items should be given in the offer. Only the prices of selected items by BN will be added to the total price while evaluating the comparative prices of the suppliers.

20. **Standard Tools.** 01 (one) set of standard tools for the maintenance of the AC Plant is to be provided. The price of standard tools is to be included in the FOB value. However, an itemised price list of standard tools is to be provided with the offer for reference value only.

21. **Spare Parts.** A recommended list of spare parts required for 05 years of satisfactory operation must be provided, indicating the itemised price. Only the prices of selected items by BN will be added to the total price while evaluating the comparative prices of the suppliers.

22. **Documents**. 02 (two) sets of following documents in English are to be provided for the AC Plant:

a. Operation Manual/ Instruction.
b. Technical Manual.
c. Maintenance Manual/ Instruction.
d. Parts Catalogue/ Spare parts List with Part No and Make (for all supplied equipment / items).
e. Complete System Drawings / Diagrams.
f. Installation Instructions and Layout Drawings / Diagrams.
g. Guarantee Certificate (by the principal).
h. Circuit Diagrams for Electric System.
j. Log book with Instruction for Daily, Weekly, Monthly and Quarterly Maintenance Checklist.
k. Other Documents/ Drawings, if Deemed Necessary.

23. **Certificates**. 02 (two) sets of following certificates in English are to be provided for the AC Plant:

a. Factory Test Certificates of all main equipment of the AC Plant.
b. Certification from ASHRAE or any other internationally recognised standards

24. **Factory Acceptance Test (FAT).**

a. Factory Acceptance Test (FAT) will be carried out by a team of two (02) BN Officers for a duration of total four (04) days excluding journey period, at the buyer's expenses. The supplier should inform the buyer about the date and schedule of FAT at least 08 (eight) weeks prior to the date of commencement of the said FAT. After inspection a joint inspection report will be prepared and singed by both the seller and buyer's representatives.

b. On completion of FAT and return from the country of FAT site, the BN officers will submit their report to NHQ concerned directorate. NHQ concerned directorate will, in turn, forward final decision along with FAT report within 02 (two) weeks, basing on which Directorate General Defence Purchase (DGDP) will render clearance for shipment of stores to the supplier concerned. The supplier will not make shipment of any item of the contract without clearance from the DGDP.

c. All types of movement/ transportation (air, sea, road, rail) of the BN officers within the manufacturer/ supplier's country, reception and arrangement for entry into country/ concerned area for the FAT are to be arranged by the supplier without any extra cost.

25. **Installation.** The supplier shall be responsible for the installation of the AC Plant as per the drawings and instructions supplied by the Manufacturer/ Principal of AC Plant at the purchaser's site.

26. **Installation Material.** All necessary installation materials are to be supplied with the plant.

27. **Test, Trial and Commissioning.**

a. On completion of installation of the supplied AC Plant, test/trial will be carried out by BN, during which the manufacturer's representative will be present.

b. Manufacturer will provide the services of at least one service engineer for the supervision of test/ trial and commissioning.

c. Cost of airfare, accommodation, food and other expenses of the manufacturer's engineer/ engineers is to be borne by the manufacturer/ supplier.

d. After completion of satisfactory tests and trials, an acceptance certificate will be signed jointly by the representative of supplier and the representative of buyer and to be forwarded to CINS office.

28. **Training**. A training plan has to be offered for seven (07) days on-site operator and component level repair and maintenance training of the AC Plant. Cost of airfare, accommodation, food and other expenses of the training engineer/ engineers are to be borne by the manufacturer/ supplier.

29. **Warranty**.

a. Warranty for trouble free operation will be provided by the principal/ manufacturer for all the supplied items for a period of at least **12 months** from the date of acceptance by the buyer.

b. During the warranty period, if the AC Plant remains non-operational for any action pending by the supplier the warranty period will be automatically extended by the same period.

c. The warranty should cover all parts and labour (including service engineer's cost) throughout the warranty period.

d. For warranty repair/ replacement, the supplier will collect the defective items from NSD Chattogram and re-supply the same to the collecting place after warranty repair/ replacement.

30. **Guarantee for Spare Parts**. The manufacturer will give guarantee to supply spare parts of all the components for a period of at least 10 years from the date of acceptance. Yearly increase of price of spares should not be more than 5% of the price list for spares to be supplied with the quotation. A certificate in this connection is required to be submitted with the offer.

31. **Shipment**.

a. The supplier will arrange shipment of all items by sea/air to Chittagong port.

b. All items are to be delivered in sea/air worthy packing to ensure safe transit by sea/air.

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. The supplier will arrange transportation of all supplied items from any sea port or airport to the site of installation.

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

32. **Delivery**.

a. The items are to be delivered within nine **(09)** months from the date of signing the contract to the following **consignee**:

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

b. **Place of Delivery**. Item to be delivered to NSD Chattogram first and after inspection by CINS it is to be delivered to BNS PEKUA (Pekua, Cox's Bazar).

c. Incase of CFR, the supplier will carry the items from Chittagong sea port/ air ports (as applicable) to NSD Chattogram/ NSSD Dhaka (as applicable) at the cost and risk of supplier.

33. **Validity of Offer**. The offer should remain valid till **180 days** from the date of tender opening.

34. **Currency**. Foreign Currency.

35. **Terms of Payment**. L/C for full purchase amount will be opened in favour of the principal supplier under the following payment terms:

a. 80% of total CFR value will be paid on delivery of the items described under the scope of supply and on production of necessary shipping documents.

b. Remaining 20% of CFR value will be paid on producing 'Acceptance Certificate' after satisfactory test and trial jointly carried out by the buyer's and supplier's representatives.

36. **Condition for Acceptance of Quotation**. Quotation has to have supporting documents (booklets, leaflet, catalogue, brochure etc) having detailed particulars of the AC Plant. If detailed information regarding specifications, maker's books and catalogue about the same model of the AC Plant quoted, spare parts, accessories, scope of supply, etc are not provided, the quotation will not be accepted.

37. **Compliance Statement**. A compliance statement fulfilling all the requirement of the tender is to be submitted for evaluation of quotations. Stating mere 'Yes' or 'No' will not suffice and detailed description/information as required is to be given. An incomplete compliance statement may attribute to cancellation of the offer. If any clause of this specification does not commensurate with offered AC Plant practically, the deviation has to be spelt out clearly.