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**TENDER SPECIFICATION FOR REVERSE OSMOSIS PLANT**  
**BNS SOMUDRA AVIJAN**

1. **Name of the Equipment.** Reverse Osmosis Plant (RO Plant).
2. **Purpose.** It should be marine type and will be used on board naval ship to produce freshwater (drinkable water) from seawater, where Silt Density Index (SDI) are normally more than 5 and total dissolved solids (TDS) will be in a range between 35,000 to 40,000 ppm.

3. **Quantity.** 2 (Two) in number.

4. **Manufacturer, Principal Supplier & Local Supplier.** Name and full address to be mentioned:

a.	Manufacturer	To be mentioned
b.	Principle Supplier	To be mentioned
c.	Local Supplier	To be mentioned

5. **Year of the Manufacture.** 2025 or later.

6. **Country of Origin.** USA, UK, EU Countries, Canada, Australia and Japan.

7. **Manufacturing Country.** USA, UK, EU Countries, Canada, Australia and Japan.

8. **Certificate/ Document of Authentication.** The local supplier must provide following original certificate(s)/ document(s) with the offer/ quotation of items as regard to the genuinity 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 favor 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 agencyship of its claimed agent of the recognized manufacturer.

9. **Operating Environment of Reverse Osmosis Plant.**

- a. Both RO plants will be installed in the engine room of the ship where high temperature and vibration are common issues. The general ambient conditions in the area of operation are as under:

a.	Air temperature	10°C - 65°C
b.	Sea water temperature	10°C - 35°C
c.	Humidity	Up to 95%
d.	Mud content in the source water	SDI more than 5
e.	TDS of source water	35,000-40,000 ppm



RESTRICTED

- b. **Allowable Inclination.** The maximum allowable athwartship and fore and aft inclinations of the ship where the reverse osmosis plants will be installed are as follows:

Ser	Direction	Static	Dynamic
(1)	Athwartship	$\pm 15^\circ$	$\pm 25^\circ$
(2)	Fore and Aft	$\pm 10^\circ$	$\pm 15^\circ$

- c. **Operating Condition.** Offered RO plants must be capable of operating at all speed range of the ship while under way, even when the ship is at anchor.

10. **Power Supply.** Available power supply of the ship is 450 V, 60 Hz, 3 Phase. In addition, ship has also the provision of using 115 V, 60Hz, 1 Phase supply for domestic use. All the motors must have the tolerance of  $\pm 10\%$  voltage fluctuation.

11. **Standard.** Offered RO Plants and their accessories are to meet relevant international standards. The standards to which the quoted RO Plants and associated accessories comply with are to be specified.

12. **Scope of Supply.**

- 2 x Reverse Osmosis Plants complete with all associated items necessary for immediate operation without the requirement of any other items (attachments, accessories, consumables etc). The plants should be compact with all equipment/item/fittings necessary for safe and efficient operation. However, the supplier is at liberty to add additional equipment/items/fittings, if it is necessary (as per paragraph 16 to 19).
- Flexible electrical cable approximately 30 m and 1 breaker (75 amp, push fitting type) for each plant.
- Optional Items and Tools (as per paragraph 20 and 21).
- Spare parts and Consumables (as per paragraph 22 to 23).
- Installation, Test/ Trial and Commissioning (as per paragraph 24 to 25).
- Onboard Training (as per paragraph 26).
- Documents and certificate (as per paragraph 27 and 28).
- Warranty and Guarantee services (as per paragraph 29 to 30).
- Any other relevant issue (if any).

13. **Site Visit.** Interested suppliers may visit the ship to have clear idea about space and necessary arrangements in order to provide a complete solution.

14. **Principle of Operation.** Reverse Osmosis. Offered plants should be operated and monitored automatically by the electronic controller.

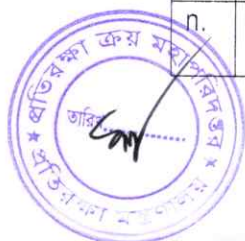
15. **Design and Record of Sales.** The quoted Reverse Osmosis plants should be of new construction, latest production model, and up to date design incorporating modern technology. The models are to be proven and necessary document in support of this is to be submitted. Record of sales of the quoted models onboard naval ships indicating year and name of vessel is to be included with the quotation.





16. Technical Specification.

a.	Type	To be mentioned
b.	Model	To be mentioned
c.	Production capacity	Not less than 1 ton/hour (Each plant)
d.	Raw water feed pump	
	(1) Type	Marine type (Horizontal, centrifugal type, bronze housing impeller)
	(2) Quantity	2 (Two) in number. One as standby
	(3) Material of construction	To be mentioned (Marine grade)
	(4) Power supply	450V, 60 Hz, 3 Phase. The motor should have the tolerance of $\pm 10\%$ voltage fluctuation
	(5) Motor efficiency	According to IEC 60034-30-1 motor efficiency rating should be IE3 or more
	(6) Discharge head	Minimum 5 mtr
	(7) Capacity	To be mentioned
e.	Multi-media filter (max 80 microns)	
	(1) Type	To be mentioned
	(2) Material of construction	GRP/ FRP (To be mentioned)
	(3) Backwash system	Backwash valve, pressure safety valve, drain valve.
	(4) Type of valve	To be mentioned
	(5) Filtering media	Graded sand, carbon, pebble etc. (To be mentioned)
	(6) Dimension of the filter vessel	To be mentioned
f.	Cartridge (secondary) filter (max 5 microns)	Poly propylene cartridge type
	(1) No of cartridge	To be mentioned
	(2) Dimension of the filter housing	To be mentioned
g.	Anti-scalant dosing unit	Variable rate dosing pump with tank.
	(1) Tank capacity	To be mentioned
h.	Motor for HP pump	Squirrel cage, induction motor
j.	HP pump	Positive displacement
	(1) Type	Plunger
	(2) Material of construction	Stainless steel
	(3) Power supply	450 V, 60 Hz, 3 Phase
	(4) Head	To be mentioned
	(5) Capacity	To be mentioned
k.	RO membrane	
	(1) Type	To be mentioned
	(2) Life of membranes	At least 3 years (To be mentioned)
	(3) No of membrane	To be mentioned
l.	RO membrane housing	
	(1) Type	Cylindrical pressure vessel type
	(2) Material	To be mentioned
	(3) Dimension	To be mentioned
m.	System for membrane cleaning	A manual system for cleaning RO membranes should be there which will comprise of stainless steel pump and chemical tank
n.	Control panel	Must contain control and monitoring of all associated pumps, motors and other instruments





RESTRICTED

p.	Charcoal cartridge filter	Disposable poly-wound type
q.	Pipe works	All pipes (except those for HP) are to be made of ABS, pressure tested to 15 bar and with solvent cemented connections
r.	HP pipe works	Must be of stainless steel, tested up to 100 bar
s.	Terminal points	Must be pressure tested at 15 bar
t.	Installation requirements	To be installed under supervision of OEM representative(s)
u.	Power supply	Plants and associated system/equipment must be operated with available power supply of the ship as indicated at article 10
v.	Max dimension	To be mentioned. Available space for installation of each plant is 240 X 230 X 200 cm (L X B X H)
w.	Weight	To be mentioned.
x.	Overall plant performance	The followings must be furnished:  a. Designed recovery rate(%) b. Max TDS content in produced water (ppm) c. Overall power consumed (kW)
y.	Maximum time for which the plant can run continuously	Must be robust to be operated continuously for a period of not less than 72 hrs
z.	Instrumentation	
	(1) On/Off selection switch	To be provided
	(2) Auto flush timer	To be provided
	(3) Indication lamps	To be provided
	(4) Product flow meter	To be provided
	(5) Reject flow meter	To be provided (Must be in between 50-150 ppm).
	(6) Safety alarm	To be provided
	(7) High pressure system pressure gauge	To be provided
	(8) TDS controller & indicator	To be provided (Will stop delivery of produced water to the service tank if TDS is found beyond allowable limit)
	(9) Running hour meter	To be provided
	(10) Emergency indication	To be provided
	(11) Low feed water pressure alarm	To be provided
	(12) Any other instrument for the operation of the plant	To be mentioned
aa.	Ultra Violet system	
	(1) Flow rate	To be mentioned

17. **Quality of Water Produced.** The quality of the drinking water produced by the plants must be of the following characteristics:

a.	Should be ready for drink without any extra treatment. TDS level is between 50-150 ppm.
b.	The produced water quality must fulfil EEC and WHO directives. An average salt rejection must be 99.4%. Necessary documents in this regard should also be enclosed
c.	Must be palatable, colourless, odourless, and free from harmful chemicals, pollutants and bio-forms.
d.	Overall, it must be suitable for human consumption without any harmful after effect.





# RESTRICTED

18. **Water Testing Equipment and Chemical.** Water testing equipment and required chemicals for testing quality of water (up to at least 5,000 running hours) are to be provided. A list, showing item wise price of equipment and chemical required is to be submitted with the quotation. The price of water testing equipment and chemical is to be included in the FOB value.

19. **Standard Accessories.** Standard accessories must include all items and accessories essential to operating each RO 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.

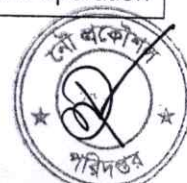
20. **Optional Items.** The quotation should include a list of optional items (if any) required to operate each RO Plant. When evaluating the comparative prices of the suppliers, only the prices of selected items by BN will be added to the total price.

21. **Tools.** 01 (one) set of standard tools for maintenance of each RO Plant is to be provided, indicating the itemised price. The quantity and size of these tools are to be mentioned in the quotation. The price of tools is to be included in the FOB value.

22. **Spare Parts** A recommended list of spare parts required for 5 (five) 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 price of the suppliers.

## a. Mechanical Spares.

Ser	Item	Qty	Remark
(1)	Variable rate dosing pump	100%	Must be provided
(2)	Pump for membrane cleaning	100%	Must be provided
(3)	Bearing (all type)	100%	For all pumps and moving parts
(4)	Pump impeller and shaft	100%	For all pumps
(5)	Seals	200%	For all pumps, valves, etc
(6)	Valve kit	100%	All types
(7)	Safety/Relief valves	100%	All types
(8)	Flexible hoses	100%	All types
(9)	Solenoid/similar valves	100%	All types
(10)	Pressure gauges/ valves	100%	All types
(11)	RO Membranes	100%	
(12)	Driving belt/ coupling	100%	All types
(13)	UV lamp	100%	
(14)	TDS indicator	100%	
(15)	Strainer	100%	
(16)	Flushing valve	100%	
(17)	Flow meter	200%	
(18)	Non return valve	100%	
(19)	Ball valve	100%	
(20)	Chemical and filters	All types for 24 months of trouble free operation	





b. **Electrical Spares.**

Ser	Item	Qty	Remark
(1)	Motor circuit breaker	100%	All types
(2)	Contactors	100%	All types
(3)	Relays	100%	All types
(4)	Indicator light	50%	All types
(5)	Diodes	50%	All types
(6)	Meters	50%	All types
(7)	Pressure switch	50%	All types
(8)	Solenoid valve	50%	All types
(9)	Sensors	150%	All types
(10)	Switches	150%	All types

23. **Chemicals and Consumables.** Chemicals and Consumables (including different filters) required for 24 months trouble free operation is also to be provided. Price of all such chemicals and consumables must be included within the total quoted price of the Water Treatment Plant. Origin and manufacturer of the Chemicals and Consumables are to be mentioned.

24. **Installation.** The item will be installed onboard BNS SOMUDRA AVIJAN by the purchaser under supervision of OEM representative. The supplier will provide all technical supervision. All necessary installation, drawing and materials are to be supplied with the complete set. In addition, 30 mtr piping for produced water and 5 mtr of pipe for raw water are to be supplied.

25. **Test, Trial and Commissioning.** On completion of installation, test, trial and commissioning will be carried out by the purchaser in presence of supplier's representative. If the trial is found satisfactory, a test/ trial certificate will be signed jointly by the representative of supplier and the representative of buyer.

26. **Onboard Training.** After completion of satisfactory test and trial, the supplier will arrange onboard operational, maintenance and trouble shooting training for a period of 3 (three) working days.

27. **Documents.** 2 (Two) sets of following documents in English are to be provided (free of cost):

- Instruction manual including technical specification.
- Maintenance manual.
- Operation manual.
- Workshop level repair manual for the plants and associated components.
- Spare parts catalogue.
- All drawings including general arrangement and installation drawing.
- Electrical circuit diagram, fault finding flow chart, etc.
- Piping and Instrument Diagram (P & ID).
- Complete winding data (Exact turns per coil, wire gauge, coil pitch, connection diagram, non-load current).

28. **Certificate.** The manufacturer is to produce a certificate, which will form a part of the contract that all the mechanical, electrical and electronic components of the RO Plant and its components are currently in production. In addition, following certificates should be provided with the RO Plants as per ISO standard:

- Certification of conformity.
- Hydrostatic test certificate.
- Factory Acceptance Test (FAT) certificate/performance certificate.
- Material certificate.



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 RO Plants 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 resupply the same to the collecting place after warranty repair/ replacement.

30. **Guarantee.** The manufacturer will guarantee to supply the spare parts for at least 10 years at reasonable price.

31. **Shipment.**

- a. The supplier will arrange shipment of all items by sea to Chattogram port.
- b. All items are to be delivered in sea/air worthy packing to ensure safe transit by sea.
- 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 to the site of installation.
- e. **Port of Shipment.** Any port of the manufacturing country. If port of shipment is other than manufacturing country due to some unavoidable reason, then a certificate from OEM is to be provided to prove genuinity of the equipments.

32. **Delivery.**

- a. The items are to be delivered within **12 (Twelve) months** from the date of signing the contract to the following **consignee**:

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

- b. **Place of delivery.** NSD Chattogram.

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:





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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, process flow diagram (showing all units/components), installation drawing etc in English) having detailed particulars of the offered RO Plants. If detailed information regarding specifications, maker's books and catalogue about the same model of the RO Plants quoted, spare parts, accessories, scope of supply, etc are not provided, the quotation will not be accepted.

37. **Compliance.** A compliance statement fulfilling all the requirement of the tender is to be submitted for evaluation of the 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 the RO Plants, the deviation has to be spelt out clearly.

