

CHANAKYA NATIONAL LAW UNIVERSITY, PATNA

Nyaya Nagar, Mithapur, Patna -1, Ph. No. – 0612-2352300, Website: <http://cnlu.ac.in>

NIQ No. – 11/2018-19 Group B

Dated: 05/06/2018

As Amended after Pre-Bid Meeting dated 08/06/2018

Properly sealed quotations are invited for and on behalf of CNLU, by the Registrar, Chanakya National Law University, Nyaya Nagar, Mithapur, Patna - 800001 from Original Manufacturers or their authorised dealers / retailers of reputed brand of Industrial RO (Reverse Osmosis) system.

Name of the work: Supply, installation & Commissioning of **Industrial RO (Reverse Osmosis) System** inside of Girls` Hostel Building and Boys Hostel Building.

Cost of Document	:	Rs. 1250/- in form of DD. DD should be in favour of Registrar, Chanakya National Law University, Nyaya Nagar, Mithapur, Patna – 800001
Work Completion Time	:	60 days from the date of work order.
EMD	:	Rs. 18,000/- in form of DD. DD should be in favour of Registrar, Chanakya National Law University, Nyaya Nagar, Mithapur, Patna – 800001
Sale of Document	:	From 05/06/2018
Date & Time of receipt of bid	:	27/06/2018 up to 03:00 pm
Date & Time of Pre Bid meeting	:	08/06/2018 at 01:30 pm
Date & Time of Presentation	:	during Pre-Bid meeting
Date & Time of opening of Technical Bid:	:	27/06/2018 at 04:30 pm
Date & Time of opening of Financial bid :	:	29/06/2018 at 04:30 pm
Place of all meeting	:	Registrar`s Chamber

Scope of work

- A. The scope of work shall include the supply, installation, commissioning, and testing of Two Nos. Industrial RO (Reverse Osmosis) system of 500 litre in totality including related pipeline wiring, laying and civil jobs (such as wall cutting, plastering, painting and complete finishing for wiring).

Eligibility

Eligibility terms for intending quotationer are as follows:

1. The quotationer should be registered under Indian Companies Act 1956 / Partnership Act or proprietorship firm. Supporting documents should be annexed along with the technical quotation.
2. The quotationer should be an India based National level Organization of repute with minimum of 7 years of operation in the field of Industrial RO (Reverse Osmosis) system supply & installation and shall have valid registration, valid GST registration certificate and Permanent Account Number (PAN) issued by respective authorities. Copies of certificates should be submitted along with technical quotation.
3. The quotationer should have a proven track record of supply, installation and commissioning of industrial RO (Reverse Osmosis) for reputed Institutes of Higher Learning / Indian Universities / Central or State Government Organizations / PSUs / Professional bodies, with at least 2 similar projects during any one of the last five years

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(from 2013-14 to 2017-18). Copy of work orders / agreements along with completion / satisfactory performance certificates be annexed along with technical quotation.

4. The quotationer should not be currently blacklisted by any Central Ministry / State Govt. Departments / Public Sector Units / Universities nor should have any litigation enquiry pending and / or initiated by any Department or Court of Law with regard to the works executed by it during the last five financial years. **The quotationer shall furnish an undertaking duly attested by notary on a non-judicial stamp paper of value Rs. 100/- (Rupees Hundred only) as per Annexure II.**
5. Those quotationers who are either blacklisted or debarred or against whom FIR has been lodged or whose contract has been rescinded by any Government /PSU or who have failed to execute the awarded work in past three years will not be allowed to participate in this bid process.
6. Quotationer should be OEM or its authorized dealer / retailer. OEM`s authorisation certificate to the effect should be submitted in envelop of technical quotation. Photocopy or scanned copy of OEM`s authorisation is not acceptable.
7. Joint Ventures are not allowed to participate in this NIQ.
8. Quoted product model should be ISO 14001-2004, ISO 9001:2008 and RoHS certified.

Terms & Conditions

1. Quotations received after due date & time shall be summarily rejected.
2. Manner of submission of the Quotations: Sealed Quotations Technical & Financial in separate sealed covers should be either dropped in the Quotation Box marked "NIQ No.-11/2018-19 dated 05/06/2018 Group 'B' for Supply, installation & Commissioning of Industrial RO (Reverse Osmosis) System" or be sent by Post at the address given above so as to reach by the due date and time. Incomplete quotations are liable for rejection. No responsibility will be taken for postal delay or non-delivery/ non-receipt of Quotation documents.
3. Quotations should be forwarded by Quotationers under their original memo / letter pad as per Format mentioned in Annexure III and IV.
4. Quotationers are advised to be present in the meeting of Pre Bid, Technical Bid and Financial Bid.
5. Quotationers are advised to study all technical and commercial aspects, instructions, terms and specifications carefully in the Quotation document. Failure to furnish all information required in the Quotation Document or submission of a quotation not substantially responsive to the Quotation document in every respect will be at the quotationers risk and may result in the rejection of the quotation.

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6. The Interested quotationers should give a detailed presentation on how their technology is best suited for the University on Pre-bid meeting. However, the committee shall have sole discretion to call for discussion/presentation.
7. This Quotation document is not transferable.
8. All documents should be signed by proprietor or an authorised signatory of firm. Original Certificate of authorisation should also be attached. Interlineations, corrections, erasures and/or over-writings shall be valid only if initialed by the person or persons signing the quotation.
9. Quotationers should attach copy of Firm registration, copy of certificate of GST registration, PAN Card in the name of firm or proprietor, Financial Statements, Brochure of make & model, ISO 14001-2004, ISO 9001:2008 and RoHS certificate of quoted make & model duly stamped & ink signed, as per check list annexed vide Annexure-I, Declaration vide Annexure-II and Technical Quotation vide Annexure -III in Technical Quotation envelope.
10. Notwithstanding anything to the contrary in this document, the Chanakya National Law University is not bound to accept the lowest quotation and reserves the right to accept or reject any quotation, to reject quotations for some or all items and to cancel the quotation process at any time prior to the award of contract, without assigning any reason whatsoever.
11. The work has to be completed within the period mentioned against works. It will be reckoned from the date of the issue of work order. If the work is not completed within the completion period liquidated damages @0.5% of agreement value per day of delay will be levied (subject to maximum of 10%). If the liquidated damages reach the level of 10% the contract is liable to be rescinded. In future, the quotationer will not be eligible to participate in quotations.
12. This notice is being issued with no financial commitment. The Buyer reserves the right to amend or vary any part thereof at any stage. Buyer also reserves the right to relax terms & conditions of the quotation in the interest of work and withdraw the Quotation, should it become necessary at any stage.
13. Service Label Agreement(SLA): During the warranty period SLA will be applicable as below:

SL No	Services	Time Limit
1	Service support should be available on all the working days of the Govt.	Sundays and General Holidays are excluded
2	Time limit for servicing during warranty period.	Within 24hrs (excluded Holidays).
3	Time limit for replacing the systems during warranty period.	15 days from the date of call attended or as mutually agreed by Vendor and CNLU authorities (depends upon the situation).
4	If the vendor fails to service/replace the unit.	An amount equivalent to 5% the quoted/accepted price of the equipment will be charged to the vendor.

14. Buyer reserves the right to withdraw / cancel / amend the quotation at any stage without assigning any reason whatsoever.

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15. OEM of Industrial RO System should have their service centre at Patna. They should provide after sales & service for a minimum period of two years after expiry of warranty period. The name and address of service centre should be indicated in the offer.
16. Quantities of items are tentative. It may increase or decrease as per requirements.
17. Warranty and onsite support on Industrial RO System will be for three years.
18. Clarification regarding contents of the quotations: During evaluation and comparison of quotations, the Buyer may, at its discretion, ask the quotationer for clarification of his quotation. The request for clarification will be given in writing and no change in prices or substance of the quotation will be sought, offered or permitted. No post-quotation clarification on the initiative of the quotationer will be entertained.
19. Quotationer with product certifications related to the quotations should be annexed with technical quotations. Alteration in the make & models will not be permitted.
20. Financial Quotations of only those firms will be opened whose Technical Quotations are found responsive.
21. Rejection of Quotations: Canvassing by the Quotationer in any form, unsolicited letter and post-Quotation correction may invoke summary rejection. Conditional Quotations will be rejected.
22. The quotationer may submit any query or ask for any clarification through written letter / e-mail (registrarcnlu@gmail.com) up to the date of pre bid meeting. Any Suggestions/Clarifications may also be put forth in the pre quotation meeting.
23. The quotationer should adhere with all seriousness to the time schedule provided by the Chanakya National Law University, Patna.
24. The quotationer shall be liable to indemnify the Chanakya National Law University, Patna in all respects and meet and pay off the litigation expenses and all the liabilities including damages, sums etc. arising out of and as a consequence of the negligence, deficiencies, mistakes, lapses, delays etc. in the execution of the various jobs and the services provided.
25. **Quotation Evaluation Process:**
 - A. **Evaluation of Technical Quotation:**
 - Detailed technical evaluation shall be carried out in relation with the conditions in the quotation document to determine the substantial responsiveness of each quotation. For this clause, the substantially responsive quotation is one that conforms to all the eligibility and terms and condition of the quotation without any material deviation.
 - The evaluation committee may call the responsive quotationer who comply all Eligibility of the quotation for discussion to facilitate and assess their understanding of the scope of work and its execution.

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B. It is mandatory for the bidder to qualify all the Technical qualifications (including eligibility criteria) to be responsive and for being considered for opening of their Financial Quotation and evaluation thereof.

26. All payments are subject to statutory deductions as and when applicable.

27. 90% payment will be made after successful installation, commissioning and product verification. Rest 10% will be released after one month from the date of first payment.

28. Dispute if any, will be subject to Patna jurisdiction only.

29. The work order placed is liable to be cancelled at any time if any document submitted by agency is found fake and misleading.

30. Amendment of Quotation Document.

30.1 At any time prior to the last date for receipt of quotations, the client may for any reason, whether at its own initiative or in response to a clarification requested by a prospective Quotationer, modify the Quotation Document by an amendment.

30.2 The amendment will be notified through official website of Chanakya National Law University for all the prospective Quotationers.

30.3 In order to afford prospective quotationer reasonable time in which to take the amendment into account in preparing their quotations, the Client may, at its discretion, extend the last date for the receipt of the Quotations.

31. The selected quotationer will have to enter into agreement within 15 days from date of issue of work order. Performance security of Rs. 27,000.00(Twenty Seven Thousands)in shape of demand draft in favour of Registrar, Chanakya National Law University, Patna issued by any scheduled / nationalized bank and be submitted at the time of agreement. If agreement is not signed within stipulated period earnest money may be forfeited. Balance 5% of performance security will be collected as deduction from bills.

32. Quantity of all items in Annexure-III is tentative. Payment of this item will be made on actual quantity installed.

33. Third Party Inspection: The vendor has to arrange for Third Party inspection by any one of the following Agencies at his own cost. LLOYDS, EIL (ENGINEERS INDIA LTD), IRS (INDIAN REGISTRAR OF SHIPPING), BV(BUREAU VERITAS) DNV(DET NORSKE VERITAS). Third party inspection cost should be included in the financial bid.

Registrar
CNLU, Patna

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Introduction:

Water is essential for life. The amount of fresh water on earth is limited, and with the rapid industrialization, its quality is under constant pressure. Preserving the quality of raw water is important not only for the drinking-water supply, but also for food production and other water uses. Water quality can be compromised by the presence of infectious agents, toxic chemicals, and radiological hazards.

Water quality deterioration in distribution systems is mainly caused by inappropriate planning, design and construction or inadequate operation and maintenance and water quality control. This has been linked to a significant proportion of the burden of waterborne and water-related illness. Stresses on these systems caused by rapid urbanization, population growth and aging infrastructure further exacerbates the problems.

The integrity of well managed distribution systems is one of the most important barriers that protect drinking-water from contamination. However, management of distribution systems often receives little attention. Distribution systems can incorrectly be viewed as passive systems with the only requirement being to transport drinking-water from the outlets of treatment plants to consumers.

Hence it is the prime responsibility of Civil Engineering Department to arrange adequate and safe supply of water of acceptable quality to CNLU premises.

Selection of water purification system:

In CNLU, normally underground water is drawn through deep tubewell to provide the safe drinking water to University premises. But where the extraction of underground water is not feasible and other sources of water not readily available, the treated water is been taken through municipal corporation of that area. Although Standards on the quality of drinking water has been laid down by organizations like BIS, ISO, Ministry of Drinking water & sanitation/Govt. of India etc., no standards has been laid regarding selection of appropriate/adequate purification system of water. Standards of quality of drinking water as per IRWM Annexure 5.2 Para 531 (physical and chemical standards) and Indian Standard - Drinking water - Specification (First Revision) IS: 10500 - 2012 is as under:

<u>Sr. No.</u>	<u>Characteristics</u>	<u>Require ment (Desirable limit)</u>	<u>Permissible limit in the absence of alternate source</u>
1	Turbidity (NTU scale)	1	5
2	Colour Hazen units	5	15
3	Taste and odour	agreeable	agreeable
4	Ph value	6.5 to 8.5	No relaxation
5	Total dissolved solids (mg/l) max.	500	2000
6	Total hardness as CaCo3(mg/l) max	200	600

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7	Chlorides as Cl ₂ (mg/l)	250	1000
8	Sulphates as SO ₄ (mg/l) max.	200	400**
9	Fluorides as F (mg/l)max.	1.0	1.5
10	Nitrates as NO ₃ (mg/l)max.	45	No relaxation
11	Calcium as Ca (mg/l) max.	75	200
12	Iron as Fe (mg/l) max.	0.3	No relaxation
13	Zinc as Zn (mg/l) max.	5.0	15.0
14	Mineral Oil (mg/l)max	0.5	No relaxation
15	Copper as Cu (mg/l) max.	0.05	1.5
16	Residual free Chlorine (mg/l) max	0.2*	1.0
	Toxic materials		
17	Arsenic as As (mg/l) max.	0.01	0.05
18	Cadmium as Cd (mg/l) max.	0.003	No relaxation
19	Lead as Pb (mg/l) max.	0.01	No relaxation

*When protection against viral infection is required, it should be min. 0.5 mg/l.

** Provided Magnesium (as Mg) does not exceed 30 mg/l.

Centre for Disease Control & Prevention, Atlanta (<http://www.cdc.gov/healthywater>) has issued a Guide to Drinking Water Treatment Technologies for Household, which is as under:

Sr. No.	Point of Use technologies that may remove small/all contaminants	Water Contaminants			
		Protozoa	Bacteria	Viruses	Chemicals
1.	Filtration				
a)	Microfiltration (approx. 0.1micron)	Very high effective	Moderate effective	Not effective	Not effective
b)	Ultra-filtration (approx. 0.01micron)	Very high effective	Very high effective	Moderate effective	Low effective

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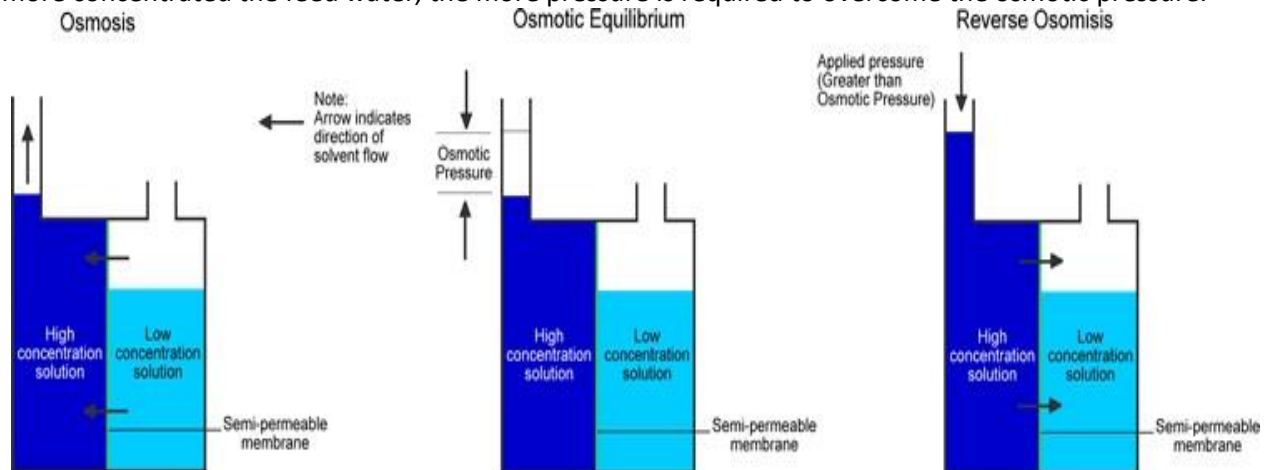
c)	Nano-filtration (approx. 0.001micron)	Very high effective	Very high effective	Very high effective	Moderate effective
2.	Reverse Osmosis (RO) Systems	Very high effective	Very high effective	Very high effective	Will remove common contaminants (metal ion, aqueous salts), including sodium chloride , copper, chromium , and lead; also reduce arsenic, fluoride, radium, sulfate, calcium , magnesium, potassium, nitrate, fluoride and phosphorus.
3.	Distillation Systems	Very high effective	Very high effective	Very high effective	Will reduce most common chemical contaminants , including arsenic, barium, chromium, lead, nitrate, sodium, sulfate and many organic chemicals
4.	Ultraviolet Treatment Systems	Very high effective	Very high effective	high effective	Not effective
5.	Water Softeners	Ion exchange technology for chemical or ion removal to reduce the amount of hardness (calcium, magnesium) in the water , can also be designed to remove iron and manganese, heavy metals, some radioactivity, nitrates, arsenic, chromium, selenium and sulfates; does not protects against protozoa, bacteria and viruses.			

Reverse Osmosis (RO) is a water purification technology that uses a semi-permeable membrane. This membrane technology is not exactly a filtration method. In reverse osmosis, an applied pressure is used to overcome osmotic pressure, a colligative property that is driven by chemical potential which is a thermodynamic parameter. Reverse osmosis through a semi-permeable membrane can remove many types of molecules and ions from solutions, and is used in both industrial processes and the production of potable water.

Reverse osmosis is most commonly known for its use in drinking water purification from seawater and those areas where water contamination includes viruses and chemicals like metal ions, lead, arsenic, fluoride, radium, sulfate, magnesium, potassium, nitrate, fluoride and phosphorus.

Working of RO (Reverse Osmosis):

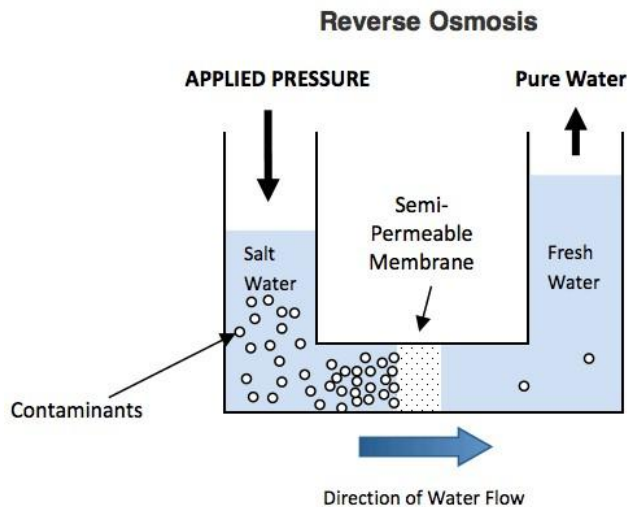
Reverse Osmosis works by using a high pressure pump to increase the pressure on the salt side of the RO and force the water across the semi-permeable RO membrane, leaving almost all (around 95% to 99%) of dissolved salts behind in the reject stream. The amount of required pressure depends on the salt concentration of the feed water. The more concentrated the feed water, the more pressure is required to overcome the osmotic pressure.



The desalinated water that is de-mineralized or de-ionized, is called permeate (or product) water. The water stream that carries the concentrated contaminants that did not pass through the RO membrane is called the reject (or concentrate) stream. *From the data collected from Reverse Osmosis System manufacturers, normally 40-60% water is rejected during the Reverse Osmosis process.*

Reverse Osmosis membrane has a tight pore structure (less than 0.0001 micron) that effectively removes up to 99% of all contaminants and impurities such as total dissolved solids, chemicals, bacteria and viruses from drinking water. Anti-microbial filters used in Reverse Osmosis also help to remove unwanted odors, colors and tastes from water.

Reverse Osmosis Systems have a very high effectiveness in removing protozoa, bacteria and viruses in comparison to other systems. Reverse Osmosis Systems can also remove common chemical contaminants (metal ions, aqueous salts), including sodium, chloride, copper, chromium, lead and can reduce arsenic, fluoride, radium, sulfate, calcium, magnesium, potassium, nitrate, and phosphorous.



Reverse Osmosis is capable of removing up to 99%+ of the dissolved salts (ions), particles, colloids, organics, bacteria and pyrogens/pathogens from the feed water (although an RO system should not be relied upon to remove 100% of bacteria and viruses). Reverse osmosis removes impurities by two distinct mechanisms. One is based on resistance to passage of ions, due to their electrical charge, this mechanism is responsible for removal of ionic impurities. Even the smallest molecules are rejected if they have ionic charge. The efficiency of removal by this mechanism is in the range of 96-99%, but this depends on the particular membrane and the ionic charge. The other mechanism of impurity removal is based on the ultrafiltration effect, in which the small pores of the reverse osmosis membranes act like molecular filters. The cut-off molecular size is approximately 14-20 nanometers. Any impurity whose molecular size is above the cut-off point will be rejected almost completely. Any impurity whose molecular size is below the cut-off point will pass through almost totally. Few organics have molecular size below 14-20 nanometers. Examples are: methanol, formaldehyde, formic acid, and ethanol.

Since RO membrane rejects contaminants based on their size and charge, many gases like carbon dioxide, hydrogen sulfide, methane, and ethane that are not ionized (charged) also have very low molecular weight will pass through reverse osmosis. Any contaminant that has a molecular weight greater than 200 is likely to be rejected by a properly running RO system. Because an RO system does not remove gases, the permeate water can have a slightly lower pH level depending on CO₂ levels in the feed water as the CO₂ is converted to carbonic acid. Some pesticides, solvents and volatile organic chemicals (VOCs) are also not removed by RO.

Types of RO Membranes:

Two materials make up the bulk of commercial RO membranes, cellulose acetate and an aromatic polyamide. Aromatic polyamide is also commercially called **thin film composite membranes**.

CTA (Cellulose Triacetate) membrane is a paper by-product membrane bonded to a synthetic layer and these require a small amount of chlorine in the water source to prevent bacteria from forming on it.

TFC (Thin Film Composite) membrane is made of a synthetic material, and requires chlorine to be removed before the water enters the membrane as chlorine causes irreversible damage to a thin film membrane element. These membranes are stronger and can be used at a higher temperature (45°C) than cellulose acetate (35°C).

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The general characteristics of reverse osmosis membranes are described below:

<u>Sr. No.</u>	<u>Limitations of various parameters</u>	<u>Cellulose acetate membranes</u>	<u>Cellulose triacetate membranes</u>	<u>Thin film composite membranes</u>
1.	pH	pH 2 - 8	pH 4 - 9	pH 2 - 11
2.	Temperature	5°C - 30°C	5°C - 35°C	5°C - 45°C
3.	Resistance to bacterial attack	poor	fair/good	excellent
4.	Resistance to damage by chlorine	fair (0 - 1 ppm)	good (0 - 3 ppm)	poor (0 - 0.1 ppm)
5.	Typical rejection of salts at 60 psi	85% - 92%	92% - 96%	94% - 98%
6.	Typical rejection of nitrate at 60 psi	30% - 50%	40% - 60%	70% - 90%
7.	Typical treated water production at 60 psi	40 liter/m ² of membrane/day	40 liter/m ² of membrane/day	80 liter/m ² of membrane/day
8.	Turbidity allowed in feed water	none	none	none
9.	Iron allowed in feed water	1ppm	1ppm	0.1ppm
10.	Relative cost	low	medium	high

Main Components of Reverse Osmosis System:

Dual Media Filter: This removes the total suspended solids, dirt, iron and reduce silt. The raw water from the source is taken to Dual Media Filter (DMF) where all the suspended solids are removed with the help of filter bed. The filter require backwash when differential pressure goes above 0.5Kg/cm² or when it stops giving desired output or after pre-decided time interval.

Activated Carbon Filter: Filtered water from dual media filter is fed to activated carbon filter in order to remove free chlorine, organic compounds, colour and smells. The filter require backwash when differential pressure goes above 0.5Kg/cm² or when it stops giving desired output or after pre-decided time interval.

Anti-scalant Dosing System: The commonly used reverse osmosis (RO) membranes consist of a polyamide salt-rejecting film on a poly-sulphone base. The very thin surface layer of polyamide (up to 3 µm) provides the semi-permeable and salt-rejecting properties to the membrane. RO systems create salt concentrated water streams on rejection sides that could produce scale or fouling on the membrane. This may lead to blocking of the flow channels in the membrane. The anti-scalant chemical is added online to protect the membrane from scaling/ fouling formation.

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Reverse Osmosis Membrane: Reverse Osmosis is the tightest possible membrane process in liquid/ liquid separation. In principle, water should be the only material passing through the membrane and essentially all dissolved and suspended material is rejected. The Reverse Osmosis Membrane is the heart of the system. The most commonly used is a spiral wound of which there are two options: the CTA (cellulose tri-acetate), which is chlorine tolerant but of lower service life, and the TFC (thin film composite/material), which is not chlorine tolerant but higher service life.

Advanced reverse osmosis technology uses "cross flow" that allows a partially permeable membrane to clean itself continuously. As some of the fluid passes through the membrane, the rest continues downstream, sweeping the rejected species away from it. The process requires a pump to push the fluid through the membrane. The higher the pressure, the larger the driving forces.

As concentration of the fluid being rejected increases, so does the driving force. Reverse osmosis is used to reject bacteria, salts, sugars, proteins, particles, dyes, and other constituents. Separation of ions with reverse osmosis is aided by charged particles. This means that dissolved ions that carry a charge, such as salts, are more likely to be rejected by the membrane. The larger the charge and the particle; the more likely it will be rejected.

Ultraviolet System: Sunlight has long since been known to kill micro-organisms. The rays from the sun contain the UV spectrum which is being used in Ultraviolet Water Treatment Systems – although at much lower intensities. It is also referred to as the Germicidal Spectrum/frequency. The frequency used in killing micro-organisms is 254 nanometers (nm). The UV lamps used for this purpose are designed specifically to have the highest amount of UV energy at this frequency.

Specification of Reverse Osmosis (RO) Plant: The technical specification of Reverse Osmosis (RO) Plant can generally be as under or as decided by tendering authority.

General features:

- The system shall be completely assembled, pre-piped, pre-wired and preferably skid mounted.
- The system shall have microprocessor based control panel for ease of operation and inbuilt process logic.
- The system shall have auto start/ stop based on water level in the supply tank.
- The system shall be equipped with Electrical panel/ MCB for plant protection and shall have integrated raw water pump with the unit.
- The system shall have integrated pretreatment modules for removal of suspended solids along with pressure gauge.
- The system shall have inbuilt protection to high pressure pump by way of low/high pressure switch.
- The system shall have the membrane of General Electric (GE) or Hydranautics make. Glycerin filled Stainless Steel pressure gauge shall be provided for durability. Online rotameter shall be provided for measuring flow. Blending cartridge shall be provided to adjust taste/TDS and followed by UV disinfection for total safety. System should have automatic backwashing of filters.
- The system shall be capable of working 24hrs.x365 days by using the semi treated water provided through Borewell / Municipal water supply.

Recovery of water (i.e. component of treated water) shall be in range of 40%-60%. If desired, the waste/ rejected water may be separately stored by using suitable pump. This water may be used for cleaning, gardening or toilet purpose.

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Technical features:

<u>Sr. No.</u>	<u>Description</u>	<u>Specification</u>	
1.	RAW WATER FEED PUMP	Type	Centrifugal
		Flow rate	1500 Litres/Hour
		Discharge Capacity	2.5 kg/cm ² (min.)
		Motor Rating	1.0HP (min.)
		Electricity	220 V, Single phase
		Quantity	1
		Make	KBL, KSB, Shakti or equivalent
2.	Pressure Sand Filter	Capacity	1500 Litres/Hour
		Min. Operating Pressure	1.5 kg/cm ²
		Media	Support bed + Carbon
		Quantity	1
3.	DUAL MEDIA FILTER (DMF)	Capacity (min.)	Not applicable
		Operating Pressure(Min)	Not applicable
		Type of Valve	Not applicable
		Media	Not applicable
		Bed depth (min.)	Not applicable
		Quantity	Not applicable
		Vessel Make	Pentair, wave or Equivalent
4.	ACTIVATED CARBON FILTER (ACF)	Capacity	1200 Litres/Hour
		Min. Operating Pressure	1.5 kg/cm ²
		Media	Activated Carbon + sand
		Quantity	1
		Vessel Make	Pentair, wave Ion Exchange or Equivalent
5.	Antiscalant Dosing System	Dosing Pump	
		Type	Electromagnetic
		Capacity	1.5 Litres/Hour
		Discharge Pressure	4 kg/cm ²
		Quantity	1
	Make	E dose, hydracell, Sandur or	

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			Equivalent
		Dosing Tank	
		Capacity	100 Litres
		Material of Const.	HDPE
		Quantity	1
		Make	Sintex, WimPlast or Equivalent
6.	Micron Cartridge Filter (For removing suspended particles >5 micron)	Capacity	1200 Litres/Hour
		Material of Cartridge	Polypropylen
		Filter Rating	5 micron
		Length	20"
		Quantity	1
		Make	Pratham, Aquapuro or Equivalent
7.	High Pressure Pump	Type of Pump	Vertical Multistage centrifugal
		Capacity	1200 Litres/Hour
		Discharge Pressure (Max.)	13 kg/cm ²
		Material of Construction	SS 304
		Electricity	220 V, Single phase
		Quantity	1
		Make	Nanfang, CRI, Yuken or Equivalent
8.	ReverseOsmosis Membrane	Permeate capacity	500 Litres/Hour
		Membrane Type	Spiral wound TFCpolyamide
		Size	Dia. 4" X 40" long
		No. of Membrane	2
		No. of Membrane Housing	2
		Skid Material of Construction	Mild Steel – Powder Coated

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		Make of Membrane	Gen. Electric, Hydronautics or Equivalent
9.	UV system	Capacity	500 Litres/Hour
		Quantity	1
		Make	Sukrut or Equivalent
10.	Instrument List	A) Pressure gauges	3 Nos.
		Range	0 – 21 bar
		Dail Size	4 inches
		Type	Bourdon
		B)Pressure switches	2 Nos.
		Range	0-450 psi
		C) Conductivity meter	1(PanelMounted)
		D) Rotameter	2
		E)Level switch	2
		F) Digital TDS Meter	1
11.	Electrical Control Panel	A)Starters, overload relays, single/three phase controller for pump	Should be provided of adequate capacity Havells/Anchor/ Equivalent
		B)Voltmeter, Ammeter, MCB's	Should be provided of adequate capacity
		C) PLC & Touch Panel	Should be provided
		D) Feed/ Product water conductivity meter	Should be provided
		Quantity	1
		Type	Electromagnetic
		Capacity	0-1.5 LPH
		Discharge Pressure	2 kg/cm ²
		Make	E dose, hydracell, Sandur or Equivalent
		Capacity	50 Litres
		Material	HDPE
		Make	Sintex, wimplast or Equivalent

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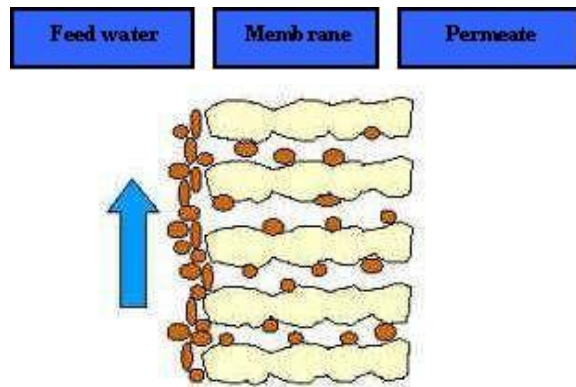
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RO Membrane Cleaning:

RO membranes will inevitably require periodic cleaning, anywhere from 1 to 3 times a year depending on the feed water quality. As a general rule, if the normalized permeate flow has decreased by 15% then it is time to clean the RO membranes. There are several different membrane cleaning methods, such as forward flush, backward flush and air flush. Chemicals may also be added in order to aid flushing.

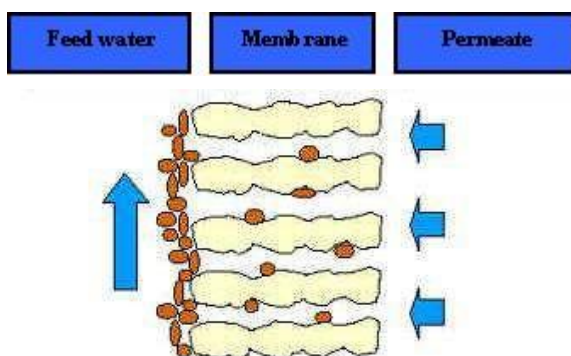
Forward flush

When forward flush is applied, membranes are flushed with feed water in forward direction. The feedwater or permeate flows through the system more rapidly than during the production phase. Because of the more rapid flow and the resulting turbulence, particles that are absorbed to the membrane are released and discharged. The particles that are absorbed to membrane pores are however not released. These particles can only be removed through backward flushing.



Backward Flush

Backward Flush is a reversed filtration process. Permeate is flushed through the feed water side of the system under pressure. When backward flush is applied the pores of a membrane are flushed inside out. The pressure on the permeate side of the membrane is higher than the pressure within the membranes, causing the pores to be cleaned.



Air Flush or Air/Water Flush

A newer cleaning method is the so-called air flush or air/ water flush. This is a forward flush during which air is injected in the supplier pipe. Because air is used, causing air bubbles to form, which cause a higher turbulence. Because of this turbulence the fouling is removed from the membrane surface.

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Chemical Cleaning

During a chemical cleaning process, membranes are soaked with a solution of chlorine bleach, hydrochloric acid or hydrogen peroxide. First the solution soaks into the membranes for few minutes and after that a forward flush or backward flush is applied, causing the contaminants to be rinsed out. RO membrane cleaning involves low and high pH cleaners to remove contaminants from the membrane. Scaling is addressed with low pH cleaners and organics, colloidal and bio-fouling are treated with a high pH cleaner. Cleaning RO membranes is not only about using the appropriate chemicals. There are many other factors involved such as flows, water temperature and quality. Hence properly designed cleaning skids and an experienced service group must be ensured for proper cleaning of RO membranes.

Maintenance of Reverse Osmosis (RO) Plant: Besides periodical cleaning of RO membrane, the maintenance and servicing of the Reverse Osmosis (RO) Plant shall consist of the following:

1. Micron Filter should be replaced during every servicing.
2. Cleaning of Sand filter.
3. Cleaning of Activated Carbon Filter
4. Antiscalming dosing chemical (As per requirement)
5. Raw water pump (Checking/servicing, if required)
6. R.O. Membrane (Checking/ Replacement, if required)
7. High pressure pump (Checking/servicing, if required)
8. Checking of flow rate of membrane & TDS on site

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Annexure-I

CHECK LIST (SHOULD BE ATTACHED WITH TECHNICAL QUOTATION DOCUMENT)

<u>Sr. No.</u>	<u>Description</u>	<u>Remarks</u>
1.	Passport size Photograph of the Quotationer / authorized Signatory holding power of attorney	
2.	Name of the Firm	
3.	Address with contact number, FAX, E-mail of the Firm	
4.	PAN No Attach copy of PAN card	
5.	Address of local office for after sales service in Patna	
6.	GST details Attach copy of Registration Certificate	
7.	Firm's Bank Account Details with Bank Name, Address and IFSC / RTGS codes	
8.	Copy of Document of Company Registration /Incorporation.	
9.	Copy of Document for ISO 14001-2004, ISO 9001:2008 and RoHS Certifications as per para 9 of Terms &Conditions. Attach copy of documents duly attested	

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10.	Copy of documents of at least 2 Industrial RO System projects during any one of the last five financial years (from 2012-13 to 2016-17) as per para 3 of Eligibility. Attach copy of documents duly attested	
11.	Annexure II as per para 4 of Eligibility.	
12.	OEM authorisation certificate as per para 6 of Eligibility.	
13.	DD of Cost of Document Details	
14.	DD of Earnest Money Deposit Details	

I / We hereby declare that information furnished above is true and correct and the documents annexed are genuine.
Signature of the Quotationer / Authorized Signatory

Name of the Quotationer

Seal of the Quotationer

Place

Date

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Annexure-II

Declaration

I / we declare

that my / our company namely..... has not been black listed by any Government / Non-Government Organisation nor should have any litigation enquiry pending and / or initiated by any of these Department or Court of Law with regards to the works executed by our company since incorporation. No FIR has been lodged against us.

The documents annexed along-with the quotation are genuine. If they are found fake or forged the Purchase Order / Agreement may be cancelled and FIR may be inflicted against us by the University

Signature of the Quotationer / Authorized Signatory

Name of the Quotationer

Seal of the Quotationer

Place

Date

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Annexure III

Technical Quotation

<u>Sr. NO</u>	<u>ITEMS</u>	<u>SPECIFICATIONS</u>	<u>Tentative Quantity</u>	<u>QUOTED MAKE & MODEL</u>	<u>COMPLIANCE WITH SPECIFICATION (PUT YES OR NO)</u>	<u>REMARKS</u>
1.	Industrial RO System of 500 litre		2 nos.			
2.	PVC Pipe	1 inch, Supreme or Equivalent	2000 ft			
3.	PVC Pipe	1/2 inch, Supreme or Equivalent	1000ft			
4.	L-bow	1 inch, Supreme or Equivalent	200 pcs			
5.	L-bow	1/2 inch, Supreme or Equivalent	200 pcs			
6.	TEE	1/2 inch, Supreme or Equivalent	50 pcs			
7.	Reducer	1x1/2 inch, Supreme or Equivalent	25 pcs			
8.	Reducer L – bow	1x1/2 inch, Supreme or Equivalent	25 pcs			
9.	Angle cook	Esco/Jaguar/equivalent	25 pcs			
10.	Solvent	Supreme or Equivalent	2 kg			
11.	Clip	1 inch GI	2000 pcs			
12.	Clip	1/2 inch GI	100 pcs			
13.	Full valve	1 inch, JELOTO or Equivalent	25 pcs			
14.	TEE	1 inch, Supreme or Equivalent	60 pcs			

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15.	Tank	1500 Ltr, Syntax-ISI	02 pcs			
16.	Tank Nepule	Supreme	08 pcs			
17.	Union	1 inch, Supreme or equivalent	50 pcs			
18.	Bend	1 inch, Supreme or equivalent	25 pcs			
19.	Connection Pipe	Prayag or equivalent	25 pcs			
20.	TEE	2 inch, Supreme or Equivalent	02 pcs			
21.	Union	2 inch, Tata or equivalent	04 pcs			
22.	Reducer	2x1 inch, GI, JELOTO or Equivalent	02 pcs			
23.	Nepule	2x6 inch, GI, Tata or equivalent	04 pcs			

Name of the Quotationer

Seal of the Quotationer

Place

Date

Registrar
CNLU, Patna

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Annexure IV

Financial Quotation

<u>Sr. NO</u>	<u>ITEMS</u>	<u>SPECIFICATIONS</u>	<u>Tentative Quantity</u>	<u>Unit rate</u>	<u>Tax</u>	<u>Total Amount with Tax</u>
1.	Industrial RO System of 500 litre		2 nos.			
2.	PVC Pipe	1 inch, Supreme or Equivalent	2000 ft			
3.	PVC Pipe	1/2 inch, Supreme or Equivalent	1000ft			
4.	L-bow	1 inch, Supreme or Equivalent	200 pcs			
5.	L-bow	1/2 inch, Supreme or Equivalent	200 pcs			
6.	TEE	1/2 inch, Supreme or Equivalent	50 pcs			
7.	Reducer	1x1/2 inch, Supreme or Equivalent	25 pcs			
8.	Reducer L – bow	1x1/2 inch, Supreme or Equivalent	25 pcs			
9.	Angle cook	Esco/Jaguar/equivalent	25 pcs			
10.	Solvent	Supreme or Equivalent	2 kg			
11.	Clip	1 inch GI	2000 pcs			
12.	Clip	1/2 inch GI	100 pcs			
13.	Full valve	1 inch, JELOTO or Equivalent	25 pcs			
14.	TEE	1 inch, Supreme or Equivalent	60 pcs			
15.	Tank	1500 Ltr, Syntax-ISI	02 pcs			
16.	Tank Nepule	Supreme	08 pcs			

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17.	Union	1 inch, Supreme or equivalent	50 pcs			
18.	Bend	1 inch, Supreme or equivalent	25 pcs			
19.	Connection Pipe	Prayag or equivalent	25 pcs			
20.	TEE	2 inch, Supreme or Equivalent	02 pcs			
21.	Union	2 inch, Tata or equivalent	04 pcs			
22.	Reducer	2x1 inch, GI, JELOTO or Equivalent	02 pcs			
23.	Nepule	2x6 inch, GI, Tata or equivalent	04 pcs			
24.	Installation of RO System		2 nos.			
25.	Wall cutting, plastering, painting and complete finishing for wiring per metre		300 metre			
26.	Pipe line wiring per metre		1000metre			

Name of the Quotationer

Seal of the Quotationer

Place

Date

**Registrar
CNLU, Patna**