

Tender Specification - Water Purification System

The scope of work includes installation and commissioning of raw water treatment plant at terrace of Electrical Science Block (ESB), Indian Institute of Technology, Madras to purify raw water into type 2 “pure water” and followed by purification of type 2 “pure water” into type 1 “pure water” for experimental trials. The complete type 2 purification system will be placed inside a wet bench at cleanroom class 100. The scope of work also covers the placement of waterlines from the raw water treatment plant to type 2 and type 1 purification system and placement of waste water drain from cleanroom class 100. The individual specifications of type 2 and type 1 “pure water” are given below.

Raw Water Treatment Plant Specifications:

This work includes the treatment of the raw water from 3000 litres capacity reservoir (will be provided by IIT M) through installing the vessels including the pressure sand filter vessel & pressure carbon filter with the define particulate filters to produce 2000 litres per hour.

Scope:

1. Installation & Commissioning of Pressure sand filter & Carbon filter vessels- 2 Nos.
2. Installation of Particle filters - (5 & 1 micron Jumbo Filters)
3. Purification Media
4. Flow Meter
5. Pumping Station
6. Installation needs to be done on the terrace of the ESB, IIT M & the distribution starts from the terrace of the building to the cleanroom class 100, mezzanine floor of the same building.
7. The material used inside the clean room should be Polypropylene homopolymer (PPH) & the connectors needs to be fitted through heat moulding to avoid bacterial contamination.
8. Automatic cut-off sensor needs to be fitted on the reservoir to avoid manual intervention.
9. The complete raw water purification should be firmly installed on a civil wall and necessary power connection will be provided by IITM.

Type-II water purification system specification:

Single purification unit will be used to purify the water purification system from the tap water into Type 2 "Pure" water. This purification system should have multiple components covering water purification unit, storage reservoir and dispenser for pure water dispensing. The water purification unit will be located inside the wet bench and the delivery units may be located on the wet bench and will display all essential information relative to the water quality, delivery, system operation, and history.

Inlet/ feed water: Tap (raw) water

Output: Type 2 "pure water" 15 liters/hour flow rate

Feed Water Acceptance: Temperature ranging from 5 to 35°C, Pressure 1-6 bar, Conductivity < 2000 $\mu\text{S}/\text{cm}$ at 25°C, Dissolved CO_2 < 30 ppm, Fouling Index (SDI) < 10, Total Chlorine < 3 ppm, TOC < 1 ppm, pH ranging 4-10, Hardness < 300 ppm, Silica < 30 ppm, Total Organic Carbon < 1 ppm, LSI < 0.3.

Type II Water Quality: Resistivity 10 to 15 $\text{M}\Omega\cdot\text{cm}$ at 25°C, Conductivity 0.2 $\mu\text{S}/\text{cm}$, TOC (ppb) < 30 ppb, Particulates - No particulates with size > 0.22 μm , RNases < 1pg/ml, DNases < 5pg/ml, Proteases < 0.15 $\mu\text{g}/\text{ml}$, Endotoxins < 0.001EU/ml, Bacteria < 0.01 CFU/ml with a flow rate of up to 2 L/min.

Continuous water quality monitoring should be available at dispensing. Water dispensing must be through a dispenser which can be located 5m away from the main unit, attached with a final filter. The volumetric dispensing should range from 20ml to 100L. A choice of final filters to install at the pure water dispenser should be available dependent on the application like particle or bacteria reduction, endotoxin and enzyme (nuclease, protease) removal.

Provision of up to two (2) remote dispensers should be attached to and controlled by one water purification unit.

Reverse Osmosis (RO) Membrane:

The system should have a high Flux thin RO Membrane. Water quality monitoring should be present after every purification stage to monitor the process of RO rejection 94-99%. Conductivity sensor should be present before & after RO.

The water purification system will divert RO permeate water to drain until it meets minimum specifications to be fed to the Electro Deionization (EDI) module ensuring the membranes are delivering water of expected quality.

System should have temperature feedback mechanism to get a constant flow rate of RO irrespective of feed water temperature.

System should be equipped with high waste recovery loop to reduce the water wastage to the drain.

Electro Deionization Module: (Input water: 5 to 15 MΩ.cm at 25°C)

A) Mixed bed ion exchange resin filled EDI module with auto regeneration by a weak electric current

B) EDI module should not require softening pre-treatment

C) Carbon beads at cathode of the EDI module to prevent scaling of the module on a long run

D) Mercury free UV lamp after EDI for bactericidal effect will be preferred

Reservoir: Capacity: 100 L Tank

A. The reservoir itself shall have an integrated mercury-free, LED-based UV lamp to automatically sanitize the interior reservoir surfaces, minimizing the risk of bacteria and biofilm proliferation in the reservoir

B. The lamp will have a 2 years lifetime

C. All water from the reservoir will be periodically recirculated through the post-EDI UV lamp to ensure low bacteria and biofilm levels

D. The reservoir itself shall have an electrical overflow sensor to eliminate the risk of drain retro-contamination

The Remote Water Delivery Unit should have a 5" full-color LCD touch screen display (resolution 800 * 480) to provide information: 1) on system status and performance parameters, 2) on routine maintenance needs and maintenance procedures, 3) on alarms for troubleshooting in the event of system malfunction, and 4) on system history and data downloading. A “Dispense Report” should be created after each dispensing event, including the water quality, volume drawn, date and time.

Systems Consumables Traceability via RFID tag technology

All water purification cartridges and point-of-use filters will have a built-in RFID tag to ensure proper installation location, note installation date, and track volumes of water passed through the purification element.

Consumables will be labeled with RFID tag carrying information such as supplier name, consumable name, catalog number, lot number. The system will also record information in the tag about consumable usage during the lifetime of the consumable (volumes dispensed, installation date, exhaustion status).

Instruction manual should be provided and supporting documents and original catalogue should be provided to validate specifications.

Type-I water purification system specification:

Water

Should able to deliver

- Resistivity: $>18.2\text{M}\Omega\cdot\text{cm}$
- TOC: $<2\text{ppb}$
- Bacteria: $<0.005\text{ CFU/mL}$

Endotoxin free water applications

- Pyrogens (endotoxins) $<0.001\text{ EU/mL}$
- RNases $<1\text{ pg/mL}$
- DNases $<5\text{ pg/mL}$
- Proteases $<0.15\text{ }\mu\text{g/mL}$

Water Quality Monitoring

System should provide assurance of water quality

- with precise on-line conductivity monitoring having a 0.01 cm^{-1} cell constant and a 0.1° C sensitive thermistor.
- Online TOC monitor should have a minimum detection limit of 0.5 to max. 999.9 ppb.

Water Quality dispensing

To meet laboratory demanding requirements and to save time

- System should have an assisted dispensing which will allow adjusting meniscus after filling up to 95-96% of desired volume.
- To manage high volume buffer preparation system should have a volumetric dispensing with an option for mL and Litres.
- If very small volumes are required we should be able to manage from dispenser and not from main menu.

Ultrapure water dispenser

Due to space constraint in the lab, the dispenser should displace the main equipment in terms of usage

- Up to 4 dispensing unit should be used for each unit. This should allow water for several different applications to be accessed from the same system.
- Delivery unit should be at least 5m away from the main unit.
- The dispensing unit should have all the information of water quality and instrument performance.
- Dispensing unit should have touch screen which can provide dispense report that can be archived in system history.
- Handle should have a rubber grip or a magnet so that users can handle it easily.

Cartridge maintenance

To maintain the consistency of water quality, cartridges should be

- Easily replaceable without any tools.
- Auto-traceability of product code/date of installation/lot No should be in built.
- 0.22 micron filter/pyrogen free filter should also have traceability, so that the exhaustion can be tracked.
- Automatic alarms should be available well before exhaustion, maybe a pictorial representation.

Data management

To avoid manual log books and data, instrument should have

- Data in an open format
- Downloadable through a data cable or USB key.
- As and when required entire history should be available which can provide information on water quality and system maintenance.

- QR code should be available to directly contact the principals for cartridge details or water quality.

Additional requirements:

1. UV lamp to be used in the water purification system can be made of mercury free to protect environment and eco-friendly disposal.
2. Instrument should be wall mounted or kept under the bench only.
3. Should provide CE, CUL and Certificate of conformity.
4. System should be installed without any tubings or wires noticed.

General Information:

1. The system must be installed by the technical persons of the OEM/Vednors.
2. Proper demonstration/training should be given to the users after successful installation.
3. All the necessary accessories should be provided.
4. The equipment should be supplied with an comprehensive warranty of three (3) years including spares, non-consumables, services.
5. The cost should include three (3) years warranty from the date of commissioning, supply and installation at site (ESB,IITM). Spares/consumables of one year for raw water, type 1 and type 2 water purification should also be included in the total cost of the system.
6. Please provide at least 3 references of laboratories (in India) where you have installed similar systems with full specification of the systems. We may reject the tender if we find the reference of the system unsatisfactory.
7. Technician should be able to attend the breakdown of system within 24 hours from intimation and contact details of technician should be provided in the bid.
8. The system should be delivered within four (4) weeks from the date of issue of purchase order (PO).
9. Please provide separate technical and financial bids in sealed envelopes.
10. Please mark tender number on top of the cover envelope.