Community Drinking Water Treatment Plants (CWTP) – Specification

(Draft Indian Standard)

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I am pleased to present here that Safe Water Network India, under the program titled 'Sustainable Enterprises for Water and Health' (SEWAH) supported by the USAID, has developed Model Documents for the decentralized Safe Water Enterprises (SWE) or Water ATMs. These Model Documents define and specify standard processes for the scale-up of SWEs.

The Model documents presented here will help set the benchmarks and frame regulatory standards for SWEs and promote standardization and accountability across the Sector. They will also serve as essential resource documents for regulating decentralized water enterprises. These model documents can be embraced to attract private sector investments and build robust public-private partnerships to deliver low-cost drinking safe water security to low economic communities.

I take this opportunity to commend Safe Water Network India for this important work, which harmonizes with the national goal and vision in providing safe water access to all citizens and empowering communities in the effective management of their water sources.

MODEL DOCUMENTS

1. Tender Document/Request for Proposal – Design, Construction, Installation, Operation & Maintenance of Water ATMs with Viability Gap Funding
2. Service Level Agreement – Operation & Maintenance of Water ATMs & Terms of Reference
3. Water ATM Audit
4. Specification for Design and Installation of Community Drinking Water Treatment Plants (CWTP) (Draft Standard)
5. Code of Practice for Design, Installation, and Maintenance of Community Drinking Water Treatment Plants (CWTP) (Draft Standard)

TECHNOLOGY INNOVATIONS FOR SAFE WATER DELIVERY

1. Online Chlorination of Overhead Tank (OHT Chlorination)
2. Overhead tank Monitoring System (OHT-MS)

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Community Drinking Water Treatment Plants (CWTP) – Specification

1. General

1.1 Purpose

This Standard aims to establish the minimum requirements for materials, design, construction and performance of public drinking water purification systems/drinking water kiosks that treat and dispense drinking water. In addition, it describes the minimum maintenance and service-related obligations.

1.2 Scope

The Standard applies to community drinking water treatment and dispensing systems, i.e., drinking water kiosks meant for community or public use. Community drinking water treatment plants (CWTP) are variously referred to as Community Water Purification Plants (CWPP) (by the State Governments), Water Vending Machines (by the Indian Railways), Water ATMs (by the Urban Local Bodies (ULBs)), Water Stores (by the Multilateral Institutions), or water kiosks (by private entrepreneurs). This standard shall apply to all such decentralized CWTPs installed in urban or rural water quality-affected locations, or in public places with heavy foot-traffic such as metro stations, railway stations, bus-stops, hospitals, courts, schools, and colleges, etc. The treated water production capacity of the systems shall range between 50 - 2,000 litres per hour (lph). The Standard shall apply to all systems utilizing any one or more of the indicative treatment technologies listed in Annex A, or any other treatment technology not listed, but utilized for drinking water production. The Standard is also applicable to mobile drinking water dispensing units, which collect treated drinking water from water treatment systems for dispensing at remote locations, as well as atmospheric generators, with regard to treated water quality.

The label 'Community Water Treatment Plant' and 'CWTP' shall be used in this standard to refer to all such decentralized drinking water treatment and dispensing systems.

1.3 Aesthetic, Chemical and Microbiological Reduction Performance Claims

All performance claims shall comply with requirements laid down by this standard. The design of the treatment system should treat specific or multiple contaminants in the raw water to produce treated water suitable for drinking in conformance to the 'acceptable limits' specified in IS 10500.

2. References

The following Indian standards contain provisions, which, through reference in this text, constitute the provisions of this standard. At the time of publication, the editions indicated are valid. All standards are subject to revision, and the specifications of the most recent editions shall apply.

IS10500: 2012	Drinking Water – Specification (Second revision)

IS 16240: 2015	Reverse Osmosis (RO) based Point-of-Use (PoU) Water Treatment Systems - Specification
IS 14724: 1999	Water Purifiers with Ultraviolet Disinfection - Specification
IS 302 (Parts 1 & 2)	Safety of household and similar electrical appliances
IS:732 – 1989	Code of practice for electrical wiring installations
IS 3025	Method of sampling and test (physical and chemical) for water and waste water
(Part 10): 1984	Turbidity (first revision)
(Part 16): 1984	Filterable residue (total dissolved solids) (first revision)
(Part 34): 1988	Nitrogen (first revision)
(Part 25): 1986	Chlorine, demand (first revision)
(Part 37): (1988)	Arsenic (first revision)
(Part 41): 1992	Cadmium (first revision)
(Part 42): 1992	Copper (first revision)
(Part 47): 1994	Lead
(Part 48): 1994	Mercury
(Part 52): 2003	Chromium
(Part 53): 2003	Iron
(Part 60): 2008	Fluoride
9845: 1998	Determination of overall migration of constituents of plastics material and articles intended to come in contact with foodstuffs - Method of analysis
2825: 1969	Code for unfired pressure vessels
2711:1979	Specification for Direct Reading pH Meters (Second revision)
4309:1979	Methods of Measurement on Direct Reading pH Meters (First revision)
1475(1): 2005	Self-contained Drinking Water Coolers - Specification - Part 1: Energy Consumption and Performance (Third revision)

3. Terminology

For this standard, the following definitions shall apply.

3.1 Community Water Treatment Plants (CWTP): Decentralized water treatment plants that provide safe drinking water to the community. Alternative names for CWTPs are Water ATMs, Water Vends, Water Vending Machines, Community Water Purification Plants, Safe Water Stations, Water Kiosks, Water Stores, etc.

3.2 Implementor - Any private or public sector agency, government organisation, non-government organisation, Urban Local Body, Gram Panchayat, or community group, responsible for setting up and management of CWTP.

3.3 Operator - Person hired by the Implementor to oversee day-to-day operation and upkeep of the CWTP, including routine maintenance, record-keeping and customer handling.

3.4 Manufacturer - Person, entity, or organisation, manufacturing water treatment system, or component of the water treatment system.

3.5 Service Provider - Person, entity or organisation, performing maintenance activities for the water treatment system or a component of the water treatment system, including repairs, replacement and technical servicing, under the terms of a contract or agreement between the Service Provider and the Implementer.

3.6 Drinking Water - The treated water intended for human consumption, for drinking and cooking purposes from any source (as per the latest revision of the IS 10500).

3.7 Feed Water or Raw Water or Source Water - Water entering the system for treatment.

3.8 Product Water or Treated Water - The water that has been treated by a treatment system.

3.9 Recovery Ratio - The ratio of Product Water to Feed Water.

3.10 Production Rate - The volume of treated water produced by a system in litres per hour (lph).

3.11 Process Media: Water-insoluble material used to reduce the concentration of dissolved or suspended substances in water through such operations as ion exchange, aeration, adsorption, absorption, oxidation, and filtration.

3.12 Spent Media or Exhausted Media: Media that has been in service and is no longer able to produce the desired treated water quality.

3.13 Regeneration - The periodic restoration of an absorbant or adsorptive media (excluding activated carbon) back to useable form by employing a chemical or a non-chemical (such as water for iron media) wash. The process of regeneration displaces the contaminants periodically from the media during the treatment process.

3.14 Influent Challenge Level - The concentration of specific contaminants, as specified for the standard test water entering a system for evaluation or type testing.

3.15 Chemical Reduction - A reduction in the quantity of one or more specified organic or inorganic contaminants by any system from feed water.

3.16 Contaminant - An undesirable physical, chemical, or microbiological substance or parameter in water that may have adverse effects on health, aesthetics or both.

3.17 Total Dissolved Solids (TDS) - The combined dissolved inorganic and organic content present in water. In general, TDS comprises of inorganic salts dissolved in water, with a small contribution from organic substances.

4. Site Development

4.1 Site Selection

The site for the Station shall be located and maintained to enable safe production of drinking water, reducing potential sources of contamination to a minimum. Refer Code of Practice for detailed recommendations

4.2 Kiosk or Shelter Design

The design of walls, floors, ceilings and windows should be such that it resists any form of contamination. Refer Code of Practice for detailed recommendations.

4.3 Source Water Supply

4.1.1 There shall be a dedicated source of the water supply which should not change. Refer Code of Practice for detailed recommendations.

5 Water Treatment System

5.1 Selection of the Primary Treatment Process

A water treatment system will usually comprise a combination of technologies for the reduction of organoleptic, chemical (organic or inorganic), or microbiological contaminants to desired levels. An indicative (not exhaustive) list of technology alternatives that may be employed for the primary treatment process is as follows: -

1. Capacitive deionization (CDI) – Refer <relevant Indian Standard>
2. Electrodialysis reversal (EDR) – Refer <relevant Indian Standard>
3. Ion-exchange Resins – Refer <relevant Indian Standard, TBD>
4. Microfiltration (MF) – Refer <relevant Indian Standard>
5. Nanofiltration (NF) – Refer <relevant Indian Standard>
6. Reverse Osmosis (RO) – Refer IS 16240
7. Ultrafiltration (UF) – Refer <relevant Indian Standard>
8. Ultraviolet Irradiation (UV) – Refer IS 14724
9. Disinfection – Common disinfection methods include chlorination, ozonisation, silver ionization, UV etc. Refer Section 5.3.2.

One or more of these systems may be incorporated in the treatment design, depending on the challenge contaminants present in the source water (Refer Annex A).

5.2 Components of Treatment System

The Source Water or Raw Water for the treatment may be subjected to a range of treatments including filtration or a combination of filtrations, disinfection, aeration or oxidation, filtration with a membrane filter, such as reverse osmosis, nanofiltration, ultrafiltration; depth filter,

cartridge filter, activated carbon filtration, de-mineralization, re-mineralization, nano-media, ultraviolet irradiation, capacitive deionisation (CDI) or any other method to treat the raw water to meet the prescribed standard. The process used for disinfection should avoid harmful byproducts or contamination in the drinking water. It is prudent to use a multiple barrier approach in the design of the treatment system. Source water quality, especially if from a groundwater source, varies in pre- and post-monsoon seasons. Similarly, in many locations, when the municipal water supply is limited or intermittent, there is a possibility of mixing of groundwater with the surface water run-off. The treatment system should have enough resilience for the expected variation in raw water quality.

5.2.1 Process Media or Resin – The Process Media (or Resin) products are designed for the reduction of dissolved or suspended materials present in drinking water, include, but are not limited to, process media used in the following processes: ion-exchange, adsorption, oxidation, aeration, and filtration.

5.2.1.1 Manufacturer use instructions

5.2.1.1.1 Media/Resin that require conditioning, dosing, use of filtration aids or specifically recommended use concentrations - The manufacturer shall provide use instructions in accompanying technical and MSDS (Material Safety Data Sheet) literature that shall be available on-site at the CWTP at all times. For process media products that are used or dosed (e.g. powdered activated carbon), use instructions shall be made available.

5.2.1.1.2 Media/Resin that require regeneration (e.g. ion-exchange resins, adsorptive media) - The manufacturer shall specify rated service cycle, or capacity expressed as a function of time or volume of water treated by the system, between required servicing of the Media (cleaning, regeneration, or replacement). The detailed instructions for carrying out Regeneration to restore filtration or treatment capability of the Media shall accompany the supplies. In addition, a write-up should accompany materials describing the facilities/plants required for carrying out the Regeneration of the media. The accompanying technical literature should clearly and prominently specify the maximum number of permitted regeneration cycles. An authorized laboratory shall evaluate the contaminant reduction performance of regenerated media used in the CWTP and certify that the regenerated media meets performance claims/requirements.

5.2.1.2 Product labelling

Process Media/Resin product containers shall facilitate traceability to the production location and shall, at a minimum, contain the following information:

- manufacturer's name and address;
- production location identifier;
- product identification (product type and, when applicable, trade name);
- net weight or net volume;
- when applicable, the mesh or sieve size;
- lot number;
- life of the media in litres or kilolitres (kL); and end of life criteria or indication (by an audible alarm or LED)
- when appropriate, special handling, storage, and use instructions.

- Specific instructions for disposal, if potentially hazardous

5.3 Treatment Chemicals

5.3.1 Chemicals for softening, scale control, anti-corrosion, and pH adjustment

Any chemicals used for water treatment should be certified food-grade or certified for drinking water treatment use.

5.3.2 Chemicals for disinfection

The Process water may be disinfected using a combination of chemical agents, ultra-violet treatment, physical membrane filtration to control the micro-organisms to a level that does not compromise drinking water safety or suitability for consumption. Various methods are adopted for disinfection including chlorination, ozonation, ultraviolet treatment, etc. or combination thereof. Any chemicals used for water treatment should be certified food-grade or certified for drinking water treatment use.

5.3.3 Chemicals for residual disinfection, pH adjustment, antiscalants or any other use - Manufacturer shall specify the prescribed dose as well as the maximum permitted dose for use in the treatment process.

5.4 Materials

5.4.1 Materials in contact with Drinking Water

Materials in contact with water shall not impart extractable contaminants that exceed the permissible level for various polymeric materials when tested as per IS 9845. Refer Annex B for the list of Indian Standards on plastics suitable for use in contact with foodstuffs, pharmaceuticals and drinking water. Also, any components in contact with water, including metallic parts, ought not to leach any contaminants into the drinking water at levels above those prescribed in the latest revision of the IS 10500. To minimise the impact of any possible leaching of the materials of construction, dispose of the treated water produced in the first hour after installation for alternate purposes and not for drinking.

5.4.2 Materials of construction

5.4.2.1 The wetted surfaces of the components of the treatment system shall be made of corrosion-resistant materials or shall have corrosion-resistant treatment or coating of food-grade quality. The coatings, when applied, shall not be soluble in water and shall not peel off at the maximum flow-velocity expected at the surface. Non-leaching material should be used in water contact surfaces.

5.4.2.2 The materials used for the construction of the treatment system shall be pressure-resistant to the extent of maximum operating pressure as specified in the relevant BIS standards (IS 2825).

5.4.3 Pipes

Piping for drinking water lines should be independent of non-potable water. Use pipes of inert and corrosion-resistant material that will not leach extractable contaminants to the water. Refer Annex A for the list of Indian Standards on plastics suitable for use in contact with foodstuffs, pharmaceuticals and drinking water.

5.4.4 Storage Tank

Use inert materials like ceramic, stainless steel or food-grade polymers (Annex B) for the construction of reservoir of storage of product water to prevent deterioration, be it by water, handling, servicing or disinfection; and should allow easy cleaning.

5.5 Performance Requirements

5.5.1 General

The treatment system shall design should specify its stated purpose, viz. the production of treated water conforming to the specifications of IS 10500 (latest revision), shall be achieved when installed and operated according to the manufacturer's instructions. In general, the treatment system shall be selected based on the characterisation of source water as regards the presence and concentration of challenge contaminants (Annex B).

5.5.2 Suggested dispensing volumes – (i) 200/250 mL, (ii) 500 mL, (iii) 1 L, (iii) 5L, (iv) 10 L, (v) 20 L. (vi) Bulk supplies for gatherings. Calibrate the dispensing volume using a calibrated volumetric measure.

5.5.3 Percentage recovery of treated water

5.5.3.1 The minimum recovery of treated water shall be as per the recommendations of the manufacturer. In case of semi-permeable membrane-based filtration (reverse osmosis or nanofiltration), a recovery rate of 50% or greater is prescribed, as generation of a concentrate (reject) stream is intrinsic to the process for carrying away contaminants. In the event of a new notification by the Ministry of Environment, Forest and Climate Change recommending a higher recovery for membrane-based treatment systems, the design shall provide for the specified permeate recovery.

5.5.3.2 The recovery shall be tested for ten continuous minutes when the system and feed water are under NTP conditions, at 27±2°C.

5.5.4 Hourly production rate – The hourly production rate of treated water of 50 lph or above, as specified by the manufacturer, shall be covered under this CWTP standard.

5.5.5 Equipping the treatment system with an in-situ or online data logger capable of recording the inlet and outlet flow rate and TDS of the treatment system is recommended. In case an automatic (digital) data logger is not available in the system, the CWTP operator or manager shall record this data daily in a register. All CWTPs using any treatment technology shall maintain a record of this data for scrutiny by the authorities. This record

will be submitted to the nominated body as per the official notifications from time to time at the recommended frequency. (See also Section 7 – Remote Monitoring System).

5.5.6 Chemical Reduction Claims – The manufacturer shall specify the contaminants as well as the limits of the claimed influent challenge levels. The product water after passage through the treatment process shall meet the maximum desirable levels ('acceptable limits') for chemical components as per the latest revision of the IS 10500.

5.5.6.1 Arsenic shall be tested at an influent challenge level of 0.3 mg/L (300 ppb) ±10% or the level claimed by the manufacturer. Manufacturer shall specify whether arsenic reduction is claimed for Arsenate [pentavalent arsenic As(V)] or total arsenic [Arsenite/As(III)+ Arsenate/As(V)]. To assess the desired efficacy, the challenge water shall be prepared with the inclusion of competing ions, according to the method laid down in {Draft Arsenic Filter Standard}. Reduction to a level below 0.01 mg/L (10 ppb) and tested according to the method specified in IS 10500 (IS 3025: part 37) ref As standard.

5.5.6.2 Fluoride shall be tested at an influent challenge level of 8 mg/L ±10% or the level claimed by the manufacturer. Reduction to a level below 0.1 mg /L shall be achieved when tested according to the method specified in IS 10500 (IS 3025: part 60) refer F standard.

5.5.6.3 Nitrate shall be tested at an influent challenge level of 150 mg/L ±10% or the level claimed by the manufacturer. Reduction to a level below 45 mg/L shall be achieved when tested according to the method specified in IS 10500 (IS 3025: part 34).

5.5.6.4 Iron shall be tested at an influent challenge level of 0.9 mg/L ±10% or the level claimed by the manufacturer. Reduction to a level below 0.3 mg/L shall be achieved when tested according to the method specified in IS 10500 (IS 3025: part 53).

5.5.6.5 Pesticides shall be tested at an influent challenge level of 0.03 mg/L ±10% of each pesticide or the level claimed by the manufacturer. Reduction to a level below 0.01 mg/L for each pesticide, and 0.05 mg/L for total pesticides, shall be achieved when tested according to the method specified in IS 10500. Refer IS 10500:2012 for the list of pesticide residues and limits.

5.5.6.6 TDS, hardness, heavy metals or any toxic substances present as dissolved contamination shall be tested at the influent challenge level claimed by the manufacturer. The reduction shall be achieved to the acceptable limit when tested in accordance with the method given in IS 10500.

5.5.7 Microbiological Reduction – The treatment system shall meet the requirements of the latest revision of the IS 10500 to deliver microbiologically safe drinking water. Compliance to requirements under 5.5.7.1 and 5.5.7.2 is mandatory, whereas compliance to sections 5.5.7.3 and 5.5.7.4 is optional, whereby the manufacturer must declare whether or not the treatment system is equipped with the capability to remove cysts.

5.5.7.1 *Escherichia coli* (or thermotolerant bacteria) shall be tested at an influent challenge level of ≥10^7 /100 ml. 99.9999% reduction or 6 log reduction value (LRV) shall be achieved when tested in accordance with the method specified in IS 10500.

5.5.7.2 MS2 (viruses) shall be tested at an influent challenge level of ≥10^7 /100 ml. 99.99% reduction or 4 LRV shall be achieved when tested in accordance with the method specified in IS 10500.

5.5.7.3 *Cryptosporidium parvum* (oocysts) shall be tested at an influent challenge level of ≥5 x10^3 /100 ml. 99.9% reduction or 3 LRV shall be achieved when tested in accordance with the method specified in IS 10500.

5.5.7.4 *Giardia lamblia* (cysts) shall be tested at an influent challenge level of ≥5 x10^3 /100 ml. 99.9% reduction or 3 LRV shall be achieved when tested in accordance with the method specified in IS 10500.

5.5.8 Sampling Plan

The sampling plan for chemical and microbiological reduction claims is shared in Annex C.

5.6 Cautions

The manufacturer shall specify the treatment limits of the system, including but not limited to (i) TDS, (ii) Hardness, (iii) Iron, (iv), Fluoride, (v) Nitrates, (vi) Arsenic (vii) LRV for microbiological contamination, or any other specified by the buyer. In addition, the endemic contaminants of a particular geography also need to be included in the system capability statements.

5.7 Structural Integrity Testing (Hydrostatic Pressure Test)

5.7.1 Structural integrity testing shall be done for the complete treatment system, pressure vessels or component systems. If the complete water treatment system is subjected to structural integrity testing, the component systems/ pressure vessels need not be tested separately.

5.7.2 The pressure vessel/s and all other components of a water treatment system that are subject to line pressure shall be designed and constructed to maintain structural integrity at a pressure as prescribed by the relevant BIS Standard or the maximum working pressure, whichever is greater (IS 2825:1969). The system shall remain watertight under the test conditions. The purpose of testing structural integrity performance is to evaluate the materials, design, and fabrication quality of the complete water treatment system.

5.7.3 Systems/components not designed for direct connection to a pressurized supply line shall be designed and constructed to maintain structure under the maximum pressure of the intended end-use in accordance with the relevant BIS standard.

5.8 Test for Water Leakage Resistance/Water-tightness

Leakage of the unit to be tested by closing the outlet of the purifier. There shall not be any leakage from any of the joints, valves, housings and connectors etc. when tested at

1.5 times the normal operating pressure. If the system is pressurised, hydrostatic pressure is to be raised slowly so that the required pressure is reached within 5 minutes, and thereafter held at that pressure for 15 minutes.

5.9 Star-Rating System

The standard recommends the following star-rating system for the applying to CWTP Implementer or the Manufacturer:

5.9.1 1 Star: Essential water treatment facility meeting all the above requirements

5.9.2 2 Star: Features of 1 Star plus an automatic Smart Card, Coin based, or Mobile Phone App-based dispensing facility

5.9.3 3 Star: All the features of 2 Star Plus a Remote Monitoring System for automatic data logging as recommended in Section 11 below

5.9.4 4 Star: All the features of 3 Star Plus operations using alternative green energy sources such as solar photovoltaic cells or wind energy in conformance to the relevant BIS standards.

5.9.5 5 Star: All the features of 4 Star Plus high recovery and/or use of the reject water for alternate uses

5.10 Electrical Safety

5.10.1 If the treatment system requires electricity for operation, the entire electrical circuit shall be insulated from the treatment system, such that leakage current shall be within limits in accordance with IS 302: Part 1 & 2.

5.10.2 The electrical circuit shall also be capable of withstanding for 1 minute, a high voltage test between body and live parts when tested in accordance with IS 302: Part 1 & 2.

5.10.3 Earthing

5.10.3.1 All parts of metallic construction shall be permanently and reliably connected to an earthing termination within the Station and shall be free of rough or sharp edges or other hazards that may cause injury to persons operating, servicing, or using the system.

5.10.3.2 All the non-current carrying metal parts of electrical installation such as metal conduits, switchgear, distribution switchboards and all other metal parts shall be bonded together and connected using two separate earth continuity conductors to the earth electrode.

5.10.3.3 The earth pin of socket outlets shall be effectively connected to the earth, and every pump-set shall have an earth electrode connection.

5.10.3.4 Earth continuity conductors shall be high conductivity. G.I. wire of cross-sectional area not less than 10 SWG shall be used. Protection against mechanical

damage/corrosion shall be provided wherever necessary by carrying earth conductor/s.

5.10.3.5 Earthing conductor shall be so placed and connected so that it is not likely to be accidentally damaged or cut. It shall be fixed over its entire length by clamps, clips, saddles, and staples, which in no way will damage the conductor.

5.10.3.6 The entire system of earthing shall be tested for mechanical and earth continuity. If need be, the earthing pit should be at a deep and moist place.

5.10.3.7 The entire system of earthing shall be tested for mechanical and earth continuity.

5.10.4 The system and installation have to comply with the following standards:

5.10.4.1 National Electrical Code SP 30 2011(R2016), Published by Bureau of Indian Standards (BIS). To comply with the latest version.

5.10.4.2 Indian Electricity Rules 1956 as amended from time to time, Published by the Central Electricity Authority.

5.10.4.3 All the electrical components of the system have to comply with the prevailing product standards of BIS.

6 Electrical Systems in the CWTP including its Instrumentation and Control Panel

6.1 ELECTRICAL CONTROL PANELS (CPs) shall be suitable for operation on single or three-phase 230/415 Volts, 50 cycles. The CPs shall comply with relevant codes of Bureau of Indian Standards and Indian Electricity Rules and Regulation in force.

6.2 All control panels shall be provided with load break switches of appropriate rating as incoming. All electrical connections will be provided with a neutral and at the distribution shall be provided with a Miniature Circuit Breakers (MCBs) as outgoing. The CP enclosure will be made of metal or industrial plastic (fire retardant low smoke FRLS), providing sufficient protection to the operator from inadvertent shocks and protection under all operating conditions.

6.3 The CPs to be installed where there is no possibility of leakage or splashing of water exists. It is imperative to design a system with inbuilt safeties in the event of leakage of water, for this purpose, suitable devices shall be incorporated to protect life and treatment system against damage.

6.4 Additionally, the CPs may include (a) measurement and ability to record the Total Dissolved Solids (TDS) and Flow as required by the relevant MoEF & CC Regulation (b) high or low voltage protection (c) lightning protection (d) remote monitoring ability with the ability to provide data logs to the authorities as prescribed (e) in the CPs, the low voltage DC (Direct Current) sensing circuit should be kept separate from high voltage AC (Alternating Current) system to avoid the two circuits crossing (f) an emergency stop may be provided for any exigency for immediate disconnection of power to the treatment system.

7 Remote Monitoring System (RMS)

7.1 The manufacturer may provide a remote monitoring system for Station operation, with digital logging of essential performance parameters, including the following-

- Feedwater flow (kL)
- Product water flow (kL)
- Product water TDS (mg/L)
- Product water pH (digital measurement is optional if handheld pH meters are available at the CWTP for daily measurement and manual entry of product water pH in a paper or digital database)

7.2 Provision may also be made for digital monitoring of additional operational parameters including-

- Sales volumes / Volumes of water dispensed
- Monitoring of 24/7 dispensing
- Power supply voltage and current drawn

7.3 Annual digital data logs will be maintained for performance parameters, for the parameters mentioned in sub-clause 7.1, and other relevant parameters for measuring the performance of the treatment system.

7.4 RMS may be supported by a modem and Cloud-based servers for data storage and analytics.

8 Automated Dispensing (where applicable)

Provision may be made for coin-based or RFID Smart Card/mobile/token or coin-based Vending Machine. RFID card/token/coin/mobile method of payment may be rechargeable by a smart application.

9 Chilled Water Dispensing (where applicable)

If a provision is made for chilling treated water before dispensing, the installation and performance of the chiller or water cooler shall be tested in accordance with the specifications of the relevant BIS Standard (IS 1475 (1):2005).

10 Disposal of waste

10.1 Any hazardous used or spent media/resin shall be taken back by the manufacturer for disposal in an environmentally safe manner, according to guidelines specified in the Hazardous Wastes (Management and Handling) Rules, 1989 or as per relevant guidelines to be specified by CPCB, in accordance to stipulations of the MoEF&CC. Alternatively, the CWTP Implementer shall comply with the requirements of the prescribed waste management and disposal.

10.2 Used Filters or membranes shall be disposed of in accordance with guidelines stipulated by the Central Pollution Control Board (CPCB).

11 Maintenance and Servicing

11.1 The product water shall be tested periodically by the maintenance service provider to verify that the system is performing satisfactorily. Source water should also be tested at the same time to track any sudden changes in source water quality. The testing frequency shall be

determined based on the design of the treatment system robustness or use of a multi-barrier approach. A minimum frequency of once every three months is recommended.

11.2 For all filtration components like sediment filter (if available), activated carbon filter (if available), micron filter or membrane element, the manufacturer shall provide a recommended schedule of change or conditions under which these need to be changed, which needs to be complied with by the CWTP Operator, Manager or Implementer. Factors affecting the performance of the filtration system shall be mentioned. All this information shall be provided by the manufacturer.

11.3 Explicit instructions shall be provided by the manufacturer, including frequency and method, for flushing and disinfection of the treatment system, including the product water storage tank.

11.4 Preventative maintenance shall be carried out for the treatment system on a quarterly basis (or more frequently) by the maintenance service provider.

11.5 Water dispensing volume shall be periodically checked and calibrated.

ANNEX A

TREATMENT TECHNOLOGY OPTIONS BASED ON CHALLENGE CONTAMINANTS IN SOURCE WATER

(i)	**Suspended and colloidal impurities**	Pressurized sand filtration, activated carbon filtration, micron filtration, ceramic filters
(ii)	**Dissolved solids**	Reverse osmosis, ion exchange resins, adsorptive media, capacitive deionization (CDI), electrodialysis reversal (EDR)
(iii)	**Microbiological contaminants**	Reverse osmosis, ultrafiltration, nanofiltration, chlorination, UV, silver ionization, ozonization, ceramic filters

ANNEX B

LIST OF INDIAN STANDARDS ON PLASTICS SUITABLE FOR USE IN CONTACT WITH FOODSTUFFS, PHARMACEUTICALS AND DRINKING WATER

9833:2018	List of colourants for use in plastics in contact with foodstuffs and pharmaceuticals (*Second Revision*)
9845:1998	Determination of overall migration of constituents of plastics materials and articles intended to come in contact with foodstuffs - Method of analysis (*Second Revision*)
IS 16738: 2018	Positive list of constituents for polypropylene, polyethylene and their copolymers for its safe use in contact with foodstuffs and pharmaceuticals
10142:1999	Polystyrene (crystal and high impact) for its safe use in contact with foodstuffs, pharmaceuticals and drinking water - specification (*First Revision*)
10149:1982	Positive list of constituents for styrene polymers in contact with foodstuffs, pharmaceuticals and drinking water *(first revision)*
4985:2000	Unplasticized PVC pipes for potable water supplies
10148:2019	Positive list of constituents for PVC and its copolymers in contact with foodstuffs, pharmaceuticals and drinking water *(first revision)*
10151: 2019	Polyvinyl chloride (PVC) and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water — Specification (*First Revision*)
10171:1999	Guide on suitability of plastics for food packaging *(second revision)*
10910:2001	Polypropylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
11434:1985	Ionomers resins for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
11435:1985	Positive list of constituents of ionomer resins for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
11704:1986	Ethylene/acrylic acid (EAA) copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
11705:1986	Positive list of constituents of Ethylene/acrylic acid (EAA) copolymers for their safe use in contact with foodstuffs, pharmaceuticals and drinking water

ANNEX C

SAMPLING PLAN OF WATER TREATMENT SYSTEMS FOR EVALUATION OF CHEMICAL AND MICROBIOLOGICAL REDUCTION CLAIMS

A-1 Randomly select 2 samples of the treatment system from the same batch. If all parameters are being run simultaneously, select 1 each for a) Microbiological parameters and b) Chemical parameters (Dissolved salts, heavy metals and pesticides).

A-2 Install and condition the selected treatment systems as per the instructions provided by the manufacturer.

A-3 Allow at least 1 volume equivalent of storage tank of product water (in line) to flow.

A-4 Conduct the test as per the sequence and frequency given below:

a) Microbiological,
b) Pesticides, and
c) Salts and heavy metals

	Week 1	*Week 2*	*Week 3*	*Week 4*
Microbiological parameters	✓	✓	✓	✓
Pesticides	✓	✓	✓	✓
Salts and heavy metals	✓	✓	✓	✓

A-5 Allow at least XX litres of product water after every sequence to wash out the previous set of contaminants. **A-6** During the non-testing days in the week, run the units with available feed water which meets water quality criteria in actual use scenario for 8 hours daily with 30 min ON & 30min OFF run time. This will simulate actual unit running scenario.

A-7 Sampling shall be done after running the systems with the influent challenge water for 15 min.

A-8 All product water samples shall be collected in duplicates and tested accordingly.

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