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Code of Practice for Design, Installation and Maintenance of Community Drinking Water Treatment Plants (CWTP) (Draft Standard)



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आज़ादी का
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सर्वोच्च न्यायालय की ओर

भारत सरकार
आवासन और शहरी कार्य मंत्रालय

GOVERNMENT OF INDIA
MINISTRY OF HOUSING AND URBAN AFFAIRS



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)

(D. Thara)

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Code of Practice for Design, Installation and Maintenance of Community Drinking Water Treatment Plants (CWTP)

1. Scope

This Standard aims to establish minimum requirements for design, installation and maintenance of Community Drinking Water Treatment Plants (CWTP), for the essential goal of ensuring that the drinking water dispensed by the CWTPs is safe and suitable for human consumption. It also defines the operations and quality information to be maintained for scrutiny by any competent authority. Besides, it describes the service-related obligations of the operator. The scope covers all decentralised/standalone CWTPs, installed in urban or rural water quality affected locations or public places such as metro stations, railway stations, bus-stops, hospitals, courts, schools, and colleges, etc. where capacities are 50 - 2,000 litres per hour (lph) of treated water production. This includes all CWTPs as defined in IS xxxxx.

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

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. However, the most recent edition is to be referred to as all standards are subject to revision.

| <i>IS No.</i> | <i>Title</i> |
|----------------|---|
| 10500: 2012 | Drinking Water – Specification (Second revision) |
| xxxxx | Community Drinking Water Treatment Plants (CWTP) – Specification |
| 3646 - 1: 1992 | Code of Practice for Interior Illumination, Part 1 |
| 9845: 1998 | Determination of overall migration of constituents of plastics material and articles intended to come in contact with foodstuffs - Method of analysis |
| 16240: 2015 | Reverse Osmosis (RO) based Point-of-Use (PoU) Water Treatment Systems - Specification |
| 14724: 1999 | Water Purifiers with Ultraviolet Disinfection - Specification |
| 302- 1&2 | Safety of household and similar electrical appliances |
| 2711:1979 | Specification for Direct Reading pH Meters (Second revision) |
| 4309:1979 | Methods of Measurement on Direct Reading pH Meters (First revision) |

3. Terminology

For this standard, the following definitions shall apply.

- 3.1** Community Water Treatment Plants (CWTP): These are decentralized water treatment plants that provide safe drinking water to the community. It may also have a facility for water dispensing around the clock. Various other names for CWTP are Water ATMs, Water Vends, Water Vending Machines, Community Water Purification Plants, Community Water Treatment Plants, Safe Water Stations, Water Kiosks, Water Stores, etc.
- 3.2** Concessioneing authority - 73rd and 74th Constitutional Amendments define “The Panchayat” and “The Municipality” as the local governing bodies for rural and urban India. Similarly, Indian Railways manage the Indian Railways. They are authorized to grants permission or concession to an Implementer for setting up and operating a CWTP, however, in other autonomous government or private institutions, the management or the governing body of the institution award such permissions or concession. Many private or social entrepreneurs set up such CWTPs after seeking approvals from the local authorities such as Revenue Authorities managing Shop and Establishment Act, etc. The concessioneing authority may define the term or the period of the award.
- 3.3** Concessionaire - The concessioneing authority, as defined above, grants the permission or concession to an Implementer. Concessionaire is any such Implementer.
- 3.4** Implementer - Any private or public sector agency, government organization, non-government organization, Urban Local Body, Gram Panchayat, or community group, responsible for setting up and management of CWTP.
- 3.5** 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.
- 3.6** Manufacturer - Person, entity, or organization, manufacturing water treatment system, or component of the water treatment system.
- 3.7** Service Provider - Person, entity or organization, 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.
- 3.8** 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).
- 3.9** Feed Water or Raw Water or Source Water - Water entering the system for treatment.
- 3.10** Product Water or Treated Water - The water that has been treated by a treatment system.

- 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** Contaminant - An undesirable physical, chemical, or microbiological substance or parameter in water that may have adverse effects on health and aesthetics or both these parameters.
- 3.13** 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

- 4.1.1 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. It should be located in areas that are free of stagnating water, smells, and away from trash dumps, sewage pits or toilets. The location should not be subject to flooding. When subsequent (after the establishment of the Station) developments in the area result in any deterioration of the conditions, appropriate remedial measures shall be put in place to prevent contamination in the final product water during its processing, storage and dispensing.
- 4.1.2 The CWTPs may be established in public areas such as bus stops, public avenues, parks, entrance/exit of Metro Station, railway stations, parking areas, marketplaces, hospitals, public gathering places, and any other place sanctioned by local government authority. There shall be a minimum distance of 500 m between two CWTPs, unless the CWTPs are on the opposite sides of a road, or on different platforms at a railway station. The site shall not interfere with pedestrian movement.

4.2 Civil Foundation

The foundation shall be made preferably using concrete and be made at an elevated platform of at least 300 mm (1 ft) above the ground level to prevent the ingress of water in case of rainfall and flooding.

4.3 Kiosk or Shelter Design

- 4.3.1 The design of walls, floors, ceilings and windows shall be such that it resists any form of contamination.
- 4.3.2 Floor, walls and roof shall preferably be constructed of cleanable/washable/sanitizable materials that are resistant to corrosion or erosion. Use termite/mold/weather/water-resistant wood, or composite wood in the construction.
- 4.3.3 Where appropriate, angles between walls, between walls and floors and between walls and ceilings should be sealed and smoothed to facilitate cleaning.

4.3.4 The structure shall be of an adequate size to provide enough working space for all operation and maintenance activities.

4.3.5 Walls

Walls shall be designed and finished to prevent dirt harborage and shall be made of washable material where appropriate. Coving shall be in place where walls meet floors to facilitate cleaning. The walls should not have any cracks and gaps that allow the accumulation of dust or harborage of pests.

4.3.6 Floors

Floors shall be made of an inert durable material and be absent of damage and dead spots. It should not be slippery.

Drains shall be located to allow effective flow away of water and liquid waste. This shall not compromise the safety of the product in any way. All drains shall be suitably covered and floors so designed to allow water to drain away quickly. There shall be no stagnant water in drains. Consideration shall be taken to ensure that siting of the equipment does not interfere with drainage.

4.3.7 Ceilings

The ceiling shall not be damaged and should not have any gaps which allow entry of dust, pests or rainwater.

Ceilings, particularly false ceilings, shall be accessible to allow cleaning and maintenance. Seals should be such that pests cannot ingress. All overheads and ceiling materials shall be constructed to enable thorough cleaning and should prevent the accumulation of dirt and debris.

4.3.8 Doors

Provision shall be made for a lockable door to prevent the entry of unauthorized personnel. Doors have smooth, non-absorbent surfaces and should be easy to clean and disinfect. External doors shall be kept closed as much as possible. Automatic or self-closers are preferable. Strip curtains, fly screens or similar shall be in place where possible to prevent the ingress of pests.

4.3.9 Windows

All windows and other openings shall be protected and/or made from a non-shatter material. Windows shall be so constructed as to avoid accumulation of dirt and those which open shall be fitted with screens. Screens should be easily movable for cleaning and kept in good repair. Internal window sills should be sloped to prevent use as shelves.

4.3.10 The size of the shelter or kiosk must be big enough to allow for the treated water tank to be housed within the lockable structure to prevent the possibility of tampering with the treated water.

4.4 Lighting

Adequate lighting shall be provided throughout the interior. Where appropriate, the lighting should not alter colours. A minimum light intensity of 220 lux (20-foot candles) is desirable in working areas. Covered fixtures should be used in the Tank and open vessel areas to prevent contamination of drinking water in case of breakage (see IS 3646 Part 1).

5. Source Water Supply

- 5.1 There shall be a dedicated source of the water supply which should not change. At the time of selection of source water supply, if a groundwater source is chosen it should be tested for the complete list of parameters specified in IS 10500. Any endemic contaminants that are found in excess of the particular 'Acceptable Limit' should be regularly monitored in the *treated water* in the regular course of operation of the CWTP, in addition to the parameters regularly monitored as specified in Annex D, and as per a defined schedule (see sub-clause 17.2).
- 5.2 In case the water source changes at any point of time after installation of the treatment system, the raw water and product water should be tested to ensure continuing compliance with IS 10500, and, if required, re-evaluate the treatment plan to suit the altered source water quality profile.
- 5.3 Source water may be groundwater drawn from borewell; surface water pumped to the CWTP; or municipal water supplied by a concessioning authority (such as the Municipality, Panchayat, or the Railways) through a pipeline or water tankers. An ample supply of raw water under adequate pressure and of suitable temperature should be available for supply to the water treatment system.
- 5.4 The water storage tank material should be approved for drinking water purposes. Raw water supply to the treatment system may require the installation of an overhead tank or Raw Water tank of suitable capacity, in addition to the installation of a pump to draw water from the designated source, if required.
- 5.5 The pipes, pumps or other possible devices coming into contact with water and used for its collection should be made of such material that they do not change the quality of water.
- 5.6 Any material including the storage tank, or piping, pumps, etc. that comes in contact with water should not impart extractable contaminants that exceed the permissible level for various polymeric materials when tested as per IS 9845.
- 5.7 Atmospheric water generators are excluded from the requirements of sub-clauses 5.1 and 5.2, as it is not possible to perform raw water quality analysis for atmospheric water content which serves as the water source for such generators. However, while generating drinking water from the atmosphere, the possibility of contamination from stack emissions from nearby industrial sources may be considered. If data for such potential sources of contamination is not available, necessary treatment steps, presuming the presence of these contaminants, must be followed to ensure compliance to IS 10500 in the treated water.
- 5.8 For extraction or collection of source water from surface water or groundwater sources or any other consistent source of water, it should be ensured that it is safe from pollution, whether caused by natural occurrence or actions or actions or neglect or ill will.

- 5.9** All possible precautions should be taken within the protected perimeter to avoid any pollution of, or external influence on, the quality of the ground or surface water or any other source of water. Preventive measures should be taken for disposal of liquid, solid or gaseous waste that could pollute the ground or surface water. Drinking water resources should not be in the path of potential sources of underground contamination.
- 5.10** The immediate surroundings of the extraction or collection area should be protected by limiting access to authorized persons only. Wellheads and spring outflows should be protected by a suitable structure to prevent entry by unauthorized individuals, pests and other sources of extraneous matter.

6. Piping

- 6.1** Piping for drinking water lines should be independent of non-potable water.
- 6.2** Any piping that comes in contact with treated water should not impart extractable contaminants that exceed the permissible level for various polymeric materials when tested as per IS 9845. Refer Annex A for the list of Indian Standards on plastics suitable for use in contact with foodstuffs, pharmaceuticals and drinking water. In general, any components in contact with treated 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.
- 6.3** In drinking water handling areas all overhead structures and fittings should be installed in such a manner as to avoid contamination directly or indirectly of drinking water and raw materials by condensation and drip and should not hamper cleaning operations. They should be insulated where appropriate and be so designed and finished as to prevent the accumulation of dirt and to minimize condensation, mould growth and flaking. They should be easy to clean.

7. Water Treatment System

The water treatment system, components and materials, and associated electrical systems should conform to the requirements laid down in IS xxxxx (CWTP-Specification).

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, TBD>
2. Electrodialysis reversal (EDR) – Refer <relevant Indian Standard, TBD>
3. Ion-exchange Resins – Refer <relevant Indian Standard, TBD>
4. Microfiltration (MF) – Refer <relevant Indian Standard, TBD>
5. Nanofiltration (NF) – Refer <relevant Indian Standard, TBD>
6. Reverse Osmosis (RO) – Refer IS 16240 <interim reference, to be updated when industry/community RO specifications developed>
7. Ultrafiltration (UF) – Refer <relevant Indian Standard, TBD>
8. Ultraviolet Irradiation (UV) – Refer IS 14724 <interim reference, to be updated when industry/community UV specifications developed>

9. Disinfection – Common disinfection methods include chlorination, ozonization, silver ionization, UV etc. Refer sub-clause 7.3.2.
10. Water-from-Air Systems/ Atmospheric water generators – Refer <relevant Indian Standard, TBD>

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 B).

7.1 Process Media or Resins

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

7.2. Manufacturer use instructions

- 7.2.1. Media/Resins that require conditioning, dosing, use of filtration aids or specifically recommended use concentrations

- 7.2.1.1. 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.

- 7.2.2. Media/Resin that require regeneration (e.g. ion-exchange resins, adsorptive media)

- 7.2.2.1. 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).

- 7.2.2.2. The detailed instructions for carrying out Regeneration to restore filtration or treatment capability of the Media shall accompany the supplies. In addition, a document should accompany materials describing the facilities/plants required for carrying out regeneration of the media.

- 7.2.2.3. The accompanying technical literature should clearly and prominently specify the maximum number of permitted regeneration cycles. An authorized lab shall evaluate the contaminant reduction performance of regenerated media used in the CWTP and certify that the regenerated media meets performance claims/requirements.

- 7.2.3. Labeling of Process Media/Resin product containers

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

7.3. Treatment Chemicals

7.3.1. 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.

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

7.3.3. 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.

7.4. Disposal of waste

7.4.1. 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.

7.4.2. Used Filters or membranes shall be disposed of in accordance with guidelines stipulated by the MoEF&CC.

7.4.3. Any reject water or waste water from system clean-in-place (CIP), backflushing (of filters, media, membranes or ion-exchange resins etc.) shall be disposed of according to norms specified by the Central Pollution Control Board (CPCB).

8. Electrical Safety

- 8.1. 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.
- 8.2. 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.
- 8.3. 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.
- 8.4. A prominently visible emergency stop switch shall be provided for shutting down the electrical systems in case of an emergency.
- 8.5. Earthing
 - 8.5.1. All the non-current carrying metal parts of electrical installation such as metal conduits, switchgear, distribution switchboards and all other parts of metal shall be bonded together and connected by means of two separate earth continuity conductors to earth electrode.
 - 8.5.2. The earth pin of socket outlets shall be effectively connected to the earth, every pump-set shall have an earth electrode connection.
 - 8.5.3. 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.
 - 8.5.4. 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.
 - 8.5.5. Earthing conductor shall be so placed and connected so that it is not likely to be accidentally damaged or cut.

9. Hand Washing Facilities

- 9.2.1. Adequate and conveniently located facilities for hand washing and drying should be provided. Where appropriate facilities for hand disinfection should also be provided.
- 9.2.2. There should be suitable hygienic means of drying hands. Where paper towels are used, a sufficient number of dispensers and receptacles should be provided adjacent to each washing facility.
- 9.2.3. Taps of a non-hand operatable type are desirable. The facilities should be furnished with properly trapped waste pipes leading to drains.

10. Space for Public Communication

The roof or the side panels of the kiosk may be used for public communication. As per the terms of the award, these panels may be used for communicating with the consumers visiting the CWTP or with the passing public for augmenting income. Clause 19 of this standard covers the essential communication meant for the consumers.

11. Personnel

The CWTP will be operated by an appropriately trained person. The responsibilities of the Operator would include daily maintenance activities, including daily quality checks, and operation of the water treatment system, if the operation requires a human interface. (Refer to Clause 16 for Personnel Training and Hygiene Requirements).

12. Maintenance of CWTP

The buildings, equipment, utensils and all other physical facilities of the CWTP, including drains, should be maintained in good repair and in an orderly condition.

12.1 Cleaning and Disinfection

- 12.1.1 To prevent contamination of drinking water, all equipment should be cleaned as frequently as necessary and disinfected whenever circumstances demand.
- 12.1.2 Adequate precautions should be taken to prevent drinking water from being contaminated during cleaning or disinfection of rooms, equipment or utensils, by wash water and detergents or by disinfectants and their solutions. Detergents and disinfectants should be suitable for the purpose intended. Any residues of these agents on a surface which may come in contact with drinking water should be removed by thorough rinsing with water, before the area or equipment is again used for handling drinking water.
- 12.1.3 Either immediately after cessation of work for the day or at such other times as may be appropriate, floors, including drains, auxiliary structures and walls of water handling areas should be thoroughly cleaned.
- 12.1.4 Changing facilities and toilets if provided should be kept clean.
- 12.1.5 Roadways and yards in the immediate vicinity of and serving the premises should be kept clean.

12.2 Hygiene Control Programme

- 12.2.1 A permanent cleaning and disinfection schedule should be drawn up for CWTP to ensure that all areas are appropriately cleaned and that critical areas, equipment and material are designated for special attention. The Operator or another designated and trained individual should be responsible for the cleanliness of the establishment. He should have a thorough understanding of the significance of contamination and the hazards involved. Any cleaning personnel should be well-trained in cleaning techniques.

13 Exclusion of Animals

- 13.1 Animals that are uncontrolled or that could be a hazard to health should be excluded from the CWTP.
- 13.2 Pest Control
 - 13.2.1 There should be an effective and continuous programme for the control of pests. The building and surrounding areas should be regularly examined for evidence of infestation.
 - 13.2.2 If pests gain entrance to the CWTP, eradication measures should be instituted. Control measures involving treatment with chemical, physical or biological agents should only be undertaken by or under the direct supervision of personnel who have a thorough understanding of the potential hazards to health resulting from the use of these agents, including those hazards which may arise from residues entering in the drinking water.
 - 13.2.3 Pesticides should only be used if other precautionary measures cannot be used effectively. Before pesticides are applied, care should be taken to safeguard drinking water, equipment and utensils from contamination. After application, contaminated equipment and utensils should be thoroughly cleaned to remove residues prior to being used again.
 - 13.2.4 Pest control measures should preferably be done through professional agencies with a clear indication of the validity period, through a certificate for the same. As far as possible, mesh or curtains shall be provided to minimise the ingress of insects.

14 Storage of Hazardous Substances

- 14.1 Any chemicals which may present a hazard to health should be suitably labeled with a warning about their toxicity and use. They should be stored in locked rooms or cabinets, and dispersed and handled only by authorized and properly trained personnel or by persons under the strict supervision of trained personnel. Extreme care should be taken to avoid contamination.
- 14.2 Except when necessary for hygienic or processing purposes, no substance which could contaminate drinking water should be used or stored in drinking water handling areas.

15 Personal Effects and Clothing

Personal effects and clothing should not be deposited in drinking water handling areas.

16 Personnel Training and Hygiene Requirements

- 16.1 If the operation of the CWTP requires a human operator, the operator should be adequately trained in the operation and day-to-day maintenance of the water treatment system.
- 16.2 The Operator should be familiar with the water quality parameters and limits as specified in the latest version of IS 10500, as well as the procedures and routines of water quality monitoring to be followed at the CWTP (see clause 17).
- 16.3 The Operator should be adequately trained in record-keeping as well as customer handling.
- 16.4 The operator should be adequately trained in the hygienic handling of drinking water, so they understand the precautions necessary to prevent contamination of the water.

- 16.4.1 Hygiene Training – Managers of CWTPs should arrange for adequate and continuing training of all water handlers in hygienic handling of water and in personal hygiene so that they understand the precautions necessary to prevent contamination of drinking water.
- 16.4.2 Medical Examination – Persons who come into contact with drinking water in the course of their work should have a medical examination prior to employment, if the official agency having jurisdiction acting on medical advice, considers that this is necessary, whether because of epidemiological considerations or the medical history of the prospective water handler. Medical examination of CWTP operator should be periodically carried out and when clinically or epidemiologically indicated.
- 16.4.3 Communicable Diseases – The management should take care to ensure that no person, whether known or suspected to be suffering from, or to be a carrier of disease likely to be transmitted or afflicted with infected wounds, skin infections, sores or diarrhoea, is permitted to work in any drinking water handling area in any capacity in which there is any likelihood of such a person directly or indirectly contaminating drinking water with pathogenic microorganisms. Any person so affected should immediately report to the management.
- 16.4.4 Injuries – Any person who has a cut or wound should not continue to handle drinking water or contact surfaces unless the injury is completely protected with a waterproof covering which is firmly secured and which is conspicuous in colour. Adequate first-aid facilities should be provided for this purpose.

16.5 Washing of Hands

The Operator, or any personnel, while on duty in a drinking water handling area, should wash the hands frequently and thoroughly with a suitable hand cleaning preparation under running warm water. Hands should always be washed before commencing work, immediately after using the toilet, after handling contaminated material and whenever else necessary. After handling any material which might be capable of transmitting disease, hands should be washed and disinfected immediately. Notices requiring hand-washing should be displayed. There should be adequate supervision to ensure compliance with this requirement.

16.6 Personal Cleanliness

Every person engaged in a drinking water handling area should maintain a high degree of personal cleanliness while on duty and should, at all times while so engaged, wear suitable protective clothing including head covering and footwear, all of which should be cleanable, unless designed to be disposed of and should be maintained in a clean condition consistent with the nature of the work in which the person is engaged. Aprons and similar items should not be washed on the floor. When drinking water is manipulated by hands. Personnel should not wear any insecure jewelry when engaged in handling drinking water.

16.7 Personal Behaviour

Any behaviour which could result in contamination of drinking water, such as eating, use of tobacco, chewing (for example, gum sticks, betel nuts, etc.) or unhygienic practices, such as, spitting, should be prohibited in drinking water handling areas.

16.8 Visitors

Precautions should be taken to prevent visitors as far as possible from visiting the drinking water handling areas. If unavoidable, the visitors should observe the provisions of clause 15 and 16.4.3.

17 Continued Water Quality Monitoring at CWTP

To ensure the reliability and safety of the drinking water dispensed, it is essential to adhere to a defined protocol for water quality monitoring, including daily testing of water quality at the CWTP itself, as well as more rigorous and comprehensive testing conducted at an NABL-accredited or FSSAI approved laboratory.

17.1 Daily Water Tests for Product Water Quality Monitoring

17.1.1 Appearance, odour, taste (organoleptic parameters IS10500) - The Operator shall perform daily checks for appearance, odour and taste of the product water, and duly record the observations in a register maintained at the CWTP.

17.1.2 TDS

17.1.2.1 The CWTP shall be equipped with a handheld electrical conductivity/TDS meter. The Operator shall perform daily measurement of TDS of the product water, and record the measurement in a register maintained at the CWTP.

17.1.2.2 TDS of product water shall be 500 ppm or below, i.e. the acceptable limit as specified in IS 10500.

17.1.2.3 The TDS meter shall be calibrated annually according to the standard operating protocol associated with the instrument.

17.1.3 pH

17.1.3.1 The CWTP shall be equipped with a handheld pH meter conforming to the specifications of the Indian Standard - Specification for Direct Reading pH Meters (IS 2711:1979 (Second revision)). The Operator shall perform daily measurement of the pH of the product water in accordance with the method described in IS 4309: 1979 (First revision), and record the measurement in a register maintained at the CWTP.

17.1.3.2 The pH of product water shall be in the range 6.5-8.5, i.e. the acceptable limit as specified in IS 10500.

17.1.3.3 The pH meter shall be calibrated annually according to the standard operating protocol associated with the instrument.

17.1.4 A proforma for the daily record of observations and measurements to be maintained at the CWTP is shared in Annex C.

17.2 Periodic Water Quality Tests at NABL-certified Laboratory at Defined Frequency

17.2.1 At a minimum, biannual frequency of water quality testing at an NABL-certified laboratory is recommended, in the pre- and post-monsoon seasons. The product (treated) water quality parameters shall be tested in accordance with the test methods specified in IS 10500.

17.2.2 An indicative list of parameters to be tested is shared in Annex D. Other relevant parameters may be included for testing if required, depending on challenge contaminants in the source water (see sub-clause 5.1). The product water should meet the acceptable limits specified in IS 10500.

- 17.2.3 The actual test parameters and frequency of testing for the product water shall be as specified by the applicable norms as laid down by the Food Safety and Standards Authority of India (FSSAI).
- 17.2.4 In case of deviation on any chemical parameter, the manufacturer's instructions for corrective action shall be followed for remediation.
- 17.2.5 If the deviant chemical parameter is above the acceptable limit, but within the permissible limit of the Drinking Water standard, corrective action will be taken to bring the parameter within the required limits within three months.
- 17.2.6 If the deviant parameter is above the permissible limit of the Drinking Water standard, water dispensing from the CWTP shall be suspended, and corrective action shall be taken to bring the parameter within the acceptable limits.
 - 17.2.6.1 After completion of procedures for remediation, a sample of product water shall be collected for repeat testing at the NABL-accredited laboratory.
 - 17.2.6.2 If the retested sample meets the acceptable limits of the Drinking Water Standard for all parameters, the CWTP may resume service with water dispensing to consumers.
- 17.2.7 If the water quality does not meet the limit for any microbiological parameter, then water dispensing from the CWTP shall be suspended immediately, and corrective action shall be taken to remove the source of contamination.
 - 17.2.7.1 The entire treatment system, including piping and drinking water storage tank, shall be cleaned and disinfected.
 - 17.2.7.2 After completion of procedures for remediation, a sample of product water shall be collected for repeat testing at the NABL-accredited laboratory.
 - 17.2.7.3 If the retested sample meets the acceptable limits of the Drinking Water Standard for all parameters, the CWTP may resume service with water dispensing to consumers.

18 Maintenance and Service of Treatment System

- 18.1 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 the use of a multi-barrier approach. However, a minimum frequency of once every three months is recommended.
- 18.2 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.

- 18.3 Explicit instructions shall be provided by the manufacturer, including frequency and procedures, for flushing and disinfection of the treatment system, including the product water storage tank.
- 18.4 Preventative maintenance shall be carried out for the treatment system on a quarterly basis (or more frequently) by the maintenance service provider.
- 18.5 Water dispensing volume shall be periodically checked and calibrated.

19 Essential Consumer Communication

The following information should be clearly on display at the Water Station

- 19.1 External Laboratory water quality test result – The latest FSSAI-approved laboratory test result of the product water quality should be displayed on the walls of the CWTP.
- 19.2 Pricing per unit of dispensing - Dispensing volumes and the pricing information shall be on display near the dispensing point in English and local Language.
- 19.3 Instructions for use of dispensing, if an automatic dispensing option is provided
- 19.4 Contact number in case of any grievance or malfunctioning of the system

20 Displays, Logs and Registers to be Maintained at CWTP

The following are to be maintained/displayed at CWTP: -

- 20.1 Maintenance/service logs and schedule of maintenance
- 20.2 Schematic diagram of the treatment process
- 20.3 Complaint register to record customer feedback
- 20.4 The latest FSSAI-approved laboratory test result for product water quality should be displayed at the CWTP (see sub-clause 19.1)
- 20.5 A daily record of observations and measurements of the water quality parameters tested in product water as well as source water at the CWTP (proforma given in Annex C)
- 20.6 Record of water quality deviations and corrective actions taken
- 20.7 Record of replacement of filtration media/filters and consumables
- 20.8 Operator details
- 20.9 Supervisor details
- 20.10 Implementer details
- 20.11 List of important phone numbers

ANNEX A

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 (<i>Second Revision</i>) |
| 9845:1998 | Determination of overall migration of constituents of plastics materials and articles intended to come in contact with foodstuffs - Method of analysis (<i>Second Revision</i>) |
| 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 (<i>First Revision</i>) |
| 10149:1982 | Positive list of constituents for styrene polymers in contact with foodstuffs, pharmaceuticals and drinking water (<i>first revision</i>) |
| 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 (<i>first revision</i>) |
| 10151: 2019 | Polyvinyl chloride (PVC) and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water — Specification (<i>First Revision</i>) |
| 10171:1999 | Guide on suitability of plastics for food packaging (<i>second revision</i>) |
| 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 B

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 C

Daily Record of Water Quality Measurements and Observations

| Month | | Year | | AOT (Appearance, Odour, Taste) | | | Handheld Meters | |
|-------|-----------------------|--|------------------|-----------------------------------|-------|-------|-----------------|----|
| Date | Location/Name of CWTP | Sample type (Product water or Source water) | Name of Operator | Appearance | Odour | Taste | TDS (mg/L) | pH |
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ANNEX D

List of Parameters for Water Quality Monitoring at CWTP

| Parameter | Units | Drinking Water Specification ¹ IS 10500:2012 | |
|--|------------|--|---|
| | | Requirement (Acceptable Limit) | Permissible Limit in the Absence of Alternative Source |
| Odour | – | Agreeable | Agreeable |
| pH value | pH Units | 6.5 – 8.5 | No relaxation |
| Turbidity, <i>max.</i> | NTU | 1 | 5 |
| Total Dissolved Solids, <i>max.</i> | mg/L | 500 | 2000 |
| Total Hardness as CaCO ₃ , <i>max.</i> | mg/L | 200 | 600 |
| Calcium, <i>max.</i> | mg/L | 75 | 200 |
| Magnesium, <i>max.</i> | mg/L | 30 | 100 |
| Iron, <i>max.</i> | mg/L | 0.3 | No relaxation |
| Chloride, <i>max.</i> | mg/L | 250 | 1000 |
| Sulphate, <i>max.</i> | mg/L | 200 | 400 |
| Fluoride, <i>max.</i> | mg/L | 1.0 | 1.5 |
| Arsenic, <i>max.</i> | mg/L | 0.01 | 0.05 |
| Nitrate (as NO ₃), <i>max.</i> | mg/L | 45 | No relaxation |
| Free Residual Chlorine ² , <i>min.</i> | mg/L | 0.2 | 1.0 |
| Total coliform bacteria | Per 100 mL | Absent | Absent |
| <i>E. coli</i> or thermotolerant coliform bacteria | Per 100 mL | Absent | Absent |

1 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of an alternative source', above which the dispensing will have to be stopped for remedial action (from IS 10500:2012).

2 To be measured in product water only.



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