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भारतीय मानक
Indian Standard

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पेयजल आपूर्ति की प्रबंधन प्रणाली — पाइप पेयजल आपूर्ति सेवा के लिए अपेक्षाएं

Drinking Water Supply Management System — Requirements for Piped Drinking Water Supply Service

ICS 13.060.01, 13.060.20, 93.025

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Public Drinking Water Services Sectional Committee, SSD 14

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Public Drinking Water Services Sectional Committee had been approved by the Service Sector Division Council.

Potable water constitutes a worldwide challenge for the 21st century, both in terms of the management of available water resources and the provision of access to drinking water**.** The provision of safe and adequate drinking water to the burgeoning Indian population is a major challenge. The lack of safe drinking water could undermine the health and wellbeing of the people. Water provided should meet the minimum drinking water quality as stipulated in IS 10500 and should be readily and conveniently accessible to consumers at all times and in all situations without any compromise to drinking water quality. As water is considered a "social good" and activities related to water services support the three aspects (economic, social and environmental) of sustainable development: it is desirable that the management of water utilities be transparent and inclusive of all stakeholders.

This standard lays down the requirements of a water utility/service provider including but not limited to, the processes involved in the procurement of raw water, its treatment and distribution, the quality of the water provided and guidelines on how to ensure the same, and the requirements/responsibilities of the management.

The aim and objectives of water utilities is to offer water services to everybody in the service area of the water utility, and to provide users with a continuous supply of drinking water. Water utilities are expected to meet the requirements of a person or a society or an organisation as per the specifications issued by the responsible bodies in conjunction with the other stakeholders.

The following documents published by the Central Government are referred in this standard.

a) Manual on Operation and Maintenance of Water Supply System, published by CPHEEO, Ministry of Housing and Urban Affairs.
b) Manual on Water Supply and Treatment, published by CPHEEO, Ministry of Housing and Urban Affairs.
c) Guidelines to Regulate and Control Ground Water Extraction in India issued by Central Ground Water Authority, Ministry of Water Resources, River Development and Ganga Rejuvenation.
d) Service Level Benchmark as performance indicator published by the Ministry of Housing and Urban Affairs, Govt of India.

In the standard, reference has been provided to ISO 19011 : 2018 'Guidelines for Auditing Management Systems'.

The composition of the Committee responsible for the formulation of this standard is given in Annex D.

This standard is applicable to and can be implemented by all such organizations which are either directly providing service to society at large or to those organizations which through their policies, directives, regulations etc, indirectly affect the services to be/being provided. The public service organizations may not necessarily be in the Government sector only. The use and implementation of this standard by public service organizations, are expected to benefit the public the consumer through increased customer satisfaction levels and the organizations through their increased efficiency and effectiveness.

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Indian Standard

DRINKING WATER SUPPLY MANAGEMENT SYSTEM — REQUIREMENTS FOR PIPED DRINKING WATER SUPPLY SERVICE

1 SCOPE

This standard specifies the requirements for management system of drinking water supplier/utility and for the assessment of piped drinking water supply services where the water supplier/utility,

a) needs to demonstrate its ability and performance to consistently provide drinking water and related utility services while ensuring compliance to applicable statutory and regulatory guidelines.

b) aims to ensure continuous supply of piped drinking water conforming to the acceptable limit of IS 10500.

NOTE — This Indian Standard is applicable to all water utilities and does not favour any particular ownership or operating model.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, all editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below

IS No.	*Title*
10500 : 2012	Drinking Water — Specifications (*second revision*)
16633 : 2017/ ISO 24512 : 2007	Activities relating to drinking water and wastewater services — Guidelines for the management of drinking water utilities and for the assessment of drinking water services
IS/ISO 9000 : 2015	Quality management systems — Fundamentals and vocabulary (*fourth revision*)

3 TERMS AND DEFINITIONS

For the purpose of this standard, the definitions given in IS/ISO 9000 and the following shall apply.

3.1 Authority — A person or society or organization having political or administrative power or right to issue order, make decision and enforce obedience.

3.2 Complaint — Expression of dissatisfaction made to a water supplier/utility related to, its service, the water supply or the complaints-handling process itself, where a response or resolution is explicitly and implicitly expected.

3.3 Customer — A person, or a group or a society or an institution/organization that benefits from water utility for piped drinking water supply management services.

3.4 Customer Service — Interaction of the water supplier/utility with the customer throughout the life cycle of a service.

3.5 Customer Satisfaction — Customer's perception of the degree to which the customer's expectations have been fulfilled.

3.6 Code of Conduct for Meeting Customer Satisfaction — Promises, made to customers by the water supplier/utility concerning its behavior, that are aimed at enhanced customer satisfaction and related provisions.

3.7 Conformity — Fulfillment of a requirement.

3.8 Customer Point of Distribution — The point where water supplier/utility supplies the piped water to the individual/ individual household/gated community/ institutions/organizations after water meter in piped water supply network.

3.9 Disaster — A sudden or unexpected or calamitous event or a natural catastrophe that causes huge or massive losses to community or society or human or property or material or economic or environment. This can be natural or anthropogenic.

3.10 Disaster Management — A society or an organization dealing with management of resources and responsibilities for handling the disaster in terms of preparedness, measures, response, and recovery.

3.11 District Metered Area (DMA) — It is sub-zone of a water distribution network zone covering a defined number of water connections for the purpose of water audit and further improvement in water supply service system.

3.12 Drinking Water — Water intended for human consumption for drinking, cooking or domestic

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purposes from any safe and secure source including treated water supplied for human consumption.

3.13 Feedback — Opinions, comments and expressions of interest of customer on the piped water supply or on services or a complaint handling process.

3.14 Infrastructure — System of facilities, structures, installations, equipments and services needed for the operation and management of the piped water supply constructed and managed by the water supplier/utility.

3.15 Inspection — Determination of conformity to specified requirements.

3.16 Management System — Set of interrelated or interacting elements of the water supplier/utility to establish policies, and objectives and the processes to achieve those objectives.

3.17 Monitoring — Determining the status of a system or a process or a product or a service or an activity.

3.18 Non-Conformity — Non fulfillment of a requirement.

3.19 Policy — Intentions and direction of the water supplier/utility as formally expressed by its top management.

3.20 Objectives — Result to be achieved.

3.21 Risk — Effect of uncertainty.

3.22 Risk Management — Coordinated act of decision on action to direct or control an action by the water utility with regard to risk associated with the services.

3.23 Relevant Authority — Public body entitled to set general act, or rules, or policies, or plans or guidelines or requirements, or to check compliance with these rules, concerning all the water suppliers/utilities included in its area of jurisdiction.

3.24 Requirement — Need or expectations that is stated, generally implied or obligatory.

3.25 Responsible Body — A society or an organization or a public body that has the overall legal responsibility for providing drinking water services for a given geographic area.

3.26 Service — Output of water utility/supplier with at least one activity necessarily performed between the water supplier/utility and the customer.

3.27 Service Area — Local geographic area where the water supplier/utility has the legal or contractual responsibility to provide the service.

3.28 Stakeholder — A person or a group or a society or an organization having an interest and concerns and involved in the services or performance of water supplier/utility.

3.29 Sustainability — The state in which components of ecosystem and their functions are maintained in view of conservation of the resources for the present and future generations

3.30 Test — Determination of quality of products/services according to requirements for a specific intended use or application.

3.31 Top Management — Person or group of people who directs and controls water supplier/utility at the highest level.

3.32 Water Utility — Whole set of a society or a body or an organization dealing with water and has processes, activities, means and resources necessarily for abstracting, transporting, treating, distributing the drinking water and providing the associated services including risk and disaster management.

3.33 Utility Services — The services provided by the water supplier/utility which includes extracting, transporting, treating, and distributing drinking water to the customer meeting the specified requirements.

3.34 Water Audit — A water audit is the assessment of quantity of the total water losses and leakage in transmission and distribution of water.

4 PIPED DRINKING WATER SUPPLY SERVICE MANAGEMENT SYSTEM

4.1 Understanding the Water Utility/Supplier and its Context

The water supplier/utility shall determine external and internal issues that are relevant to its purpose (including the sustainability of its resources) and its strategic direction and that affect its ability to achieve the intended result(s) of its management system.

The water supplier/utility shall monitor and review information about these external and internal issues.

NOTES

1 Issues can include positive and negative factors or conditions for consideration.

2 Understanding the external context can be facilitated by considering issues arising from legal, technological, competitive, market, cultural, social and economic environments, whether international, national, regional or local.

3 Understanding the internal context can be facilitated by considering issues related to values, culture, knowledge and performance of the water supplier/utility.

4.2 Understanding the Needs and Expectations of Interested Parties

The water supplier/utility shall identify,

a) the interested parties including statutory and regulatory bodies that are relevant to the piped drinking water supply service management system;

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b) the requirements and feedback of the stakeholders that are relevant to the piped drinking water supply service management system; and

c) mechanism for sustainability of the resources.

4.3 Determining the Scope of the Piped Drinking Water Supply Service Management System

The water supplier/utility shall determine the boundaries and applicability of the piped drinking water supply service management system to establish its scope.

When determining this scope, the water supplier/utility shall consider,

a) the external and internal issues related to services referred to in **4.1**, and

b) the requirements of relevant stakeholders referred to in **4.2**.

The scope of the water supplier/utility management system shall be available and be maintained as documented information. The scope shall state the types of services covered, and provide justification for any requirement of this standard that the water supplier/utility determines is not applicable to the scope of its management system.

4.4 General Requirements

The water supplier/utility shall establish, implement, operate, maintain and continually improve a piped drinking water supply service management system, including the processes needed and their interactions, in accordance with the requirements of this standard.

The water supplier/utility shall,

a) ensure an installed and functional water intake works at the source of water;

b) ensure transmission of the water from intake works to the water treatment plant;

c) ensure water treatment at water treatment plant, and safe disposal of residues, adopting appropriate methods and/or processes;

d) ensure that the treated water conforms to the acceptable limits of IS 10500;

e) ensure water storage, and distribution to the customer at a specified pressure as per applicable norms/guidelines;

NOTE — The nominal pressure of water at household level may be referred from the Manual on Water Supply and Treatment, published by CPHEEO, Ministry of Housing and Urban Affairs as well as the guidelines issued by the State/UT government from time to time.

f) establish a Management Information System (MIS);

g) determine the resources needed for these processes and ensure their availability;

h) assign the responsibilities to the concerned for these processes;

j) address the risks and opportunities;

k) evaluate these processes and implement any changes needed to ensure that these processes achieve their results, efficiently as per the prescribed norms; and

m) improve the piped drinking water supply service management system.

4.5 Records

To the extent necessary, the water supplier/utility shall,

a) maintain documented information to support the operation of its processes;

b) retain documented information to have confidence that the processes are being carried out as per planned scheduled;

c) maintain the records of the workforce employed and needed, as per schedule; and

d) maintain records to establish traceability of water/ processes causing major/minor non-conformity.

5 LEADERSHIP

5.1 Leadership and Commitment

5.1.1 *General*

Top management shall demonstrate leadership and commitment with respect to the drinking water supply services management system by,

a) taking accountability for the effectiveness of the piped drinking water supply services management system as per this standard;

b) ensuring that the policy and objectives are established and are compatible with the context and strategic direction of the water supplier/utility;

c) promoting the use of the process approach and risk-based thinking;

d) ensuring that the resources needed for the piped quality of drinking water supply services management system are available;

e) ensuring that the drinking water supply services management system achieves its intended results;

f) communicating the importance of effective management and of conforming to the management system requirements;

g) engaging, directing and supporting persons to contribute to the effectiveness of the management system; and

h) promoting improvement through system up-gradation and resources enhancement.

5.1.2 *Customer Focus*

Top management shall demonstrate leadership and commitment with respect to customer focus by ensuring that:

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a) customer and applicable statutory and regulatory requirements are determined, understood and consistently met to satisfy the customer;

b) the risks and opportunities that can affect conformity of products and services and the ability to enhance customer satisfaction are determined and addressed; and

c) the focus on enhancing customer satisfaction is maintained.

5.2 Policy

5.2.1 *Establishing the Policy for Piped Drinking Water Supply Services*

Top management shall establish, implement and maintain a policy that,

a) is appropriate to the purpose and context of the water supplier/utility and supports its strategic direction;

b) provides a framework for setting objectives;

c) includes a commitment to satisfy applicable requirements; and

d) includes a commitment to continual improvement of the quality of piped drinking water supply service management system.

5.2.2 *Communicating the Policy*

The policy shall,

a) be available and be maintained as documented information;

b) be communicated and understood and applied within the water supplier/utility;

c) be available to interested parties, as appropriate; and

d) be displayed on the water utility's website.

5.3 Organizational Roles, Responsibilities and Authorities

Top management shall ensure that the responsibilities and authorities for relevant roles are assigned, communicated and understood within the water utility.

Top management shall assign the responsibility and authority for,

a) ensuring that the piped drinking water supply service management system conforms to the requirements of this standard;

b) ensuring that the processes are delivering their intended outputs;

c) reporting on the performance of the piped drinking water supply service management system and on opportunities for improvement in particular to top management;

d) ensuring the promotion of customer focus throughout the organization;

e) ensuring that the integrity of the system is maintained when changes to the drinking water supply service system are planned and implemented;

f) ensuring the plan of action in case of emergency for repairing or restoring the normal services within 24 h to 36 h, or as per the charter of the water utility; and

g) ensuring the plan of action in case of disaster (anthropogenic or natural) (*see* Annex A).

6 PLANNING

6.1 Actions to Address Risks and Opportunities

6.1.1 When planning for the piped drinking water supply services management system, the water supplier/utility shall consider the issues referred to in **4.1** and **4.2** and determine the risks and opportunities that need to be addressed to,

a) give assurance that the piped drinking water supply management system can achieve it's intended result(s);

b) enhance desirable effects;

c) prevent, or reduce, undesired effects; and

d) achieve improvement.

6.1.2 The water supplier/utility shall plan,

a) actions to address these risks and opportunities; and

b) how to integrate and implement the actions into its management system processes and evaluate the effectiveness of these actions.

Actions taken to address risks and opportunities shall be proportionate to the potential impact on the conformity of product and services.

NOTE — Options to address risks can include avoiding risk, taking risk in order to pursue an opportunity, eliminating the risk source, changing the likelihood or consequences, sharing the risk, or retaining risk by informed decision.

6.1.3 *Disaster Management*

The water supplier/utility shall have a documented disaster management plan for implementation.

Guidance may be taken from Annex A.

6.1.4 *Plan for Emergency*

In case of emergencies that may arise due to power failure, breakdown in water supply system units, vandalism, strikes by workforce, etc, an emergency response plan shall be prepared well in advance to meet such incidents/exigencies including associated documents (like, shut off check list, contact information, notices to public, individual responsibilities etc) and shall be periodically rehearsed. Records of mock drills shall also be kept in record.

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6.2 Objectives for the Drinking Water Supplier/Utility

6.2.1 *General*

The Water supplier/utility shall establish objectives at relevant functions, levels and processes needed for the piped drinking water supply services management system.

The objectives shall,

a) be consistent with its policy;
b) be measurable with respect to specified standards;
c) take into account applicable requirements;
d) be monitored;
e) be communicated; and
f) be updated as appropriate.

The water supplier/utility shall maintain documented information on the objectives of piped drinking water supply services.

6.2.2 When planning to achieve its objectives, the water supplier/utility shall determine,

a) the present status;
b) the goal to achieve;
c) action plan;
d) resources required;
e) responsible persons;
f) timeline for completion; and
g) methodology for evaluation of results.

6.3 Planning of Changes

When the water supplier/utility determines the need for changes to the management system, the changes shall be carried out in a planned manner.

The water supplier/utility shall consider,

a) the need for the change and the expected gain;
b) the purpose of the changes and their potential consequences on the drinking water quality and related services;
c) the integrity of the management system;
d) the availability of resources; and
e) the allocation or reallocation of responsibilities and authorities.

7 SUPPORT

7.1 Resources

7.1.1 *General*

The water supplier/utility shall determine, and provide the resources needed for the establishment, implementation, maintenance and continual improvement of the drinking water supply service management system.

The water supplier/utility shall consider,

a) the available internal resources and constraints;
b) the resources required; and
c) what needs to be obtained from external providers.

7.1.2 *People*

The water supplier/utility shall determine, and provide the persons necessary for the effective implementation of its drinking water supply service management system and for the operation and control of its processes.

7.1.3 *Infrastructure*

7.1.3.1 The water supplier/utility shall determine, provide and maintain the infrastructure necessary for the operation of its processes and to achieve conformity of drinking water as per the acceptable limits of IS 10500.

NOTE — Infrastructure can include,

a) buildings and associated utilities;
b) equipment, including hardware and software;
c) transportation resources; and
d) information and communication technology.

7.1.3.2 *Maintenance*

In order to keep the plant, equipment, structures and other related facilities in optimum working order, the water supplier/utility shall prepare risk assessment and mitigation plan. This plan shall contain procedures/work instructions for routine tasks, checks and inspections at intervals *viz*. daily, weekly, quarterly, semi-annually or annually. In addition to this, the individual plans shall be prepared for all units and the required component of equipment. Checklists may be prepared, if required, to ensure that the actions indicated in the operation and maintenance plan are carried out promptly and properly.

A well-organized stores unit having requisite number of workforces, machines and material for restoration and maintenance shall be available, and accessible at all times.

The water supplier/utility shall have record system including the following minimum information, wherever required, or in accordance with the requirement of each equipment manufacturer, to ensure the required maintenance of the equipment:

a) Name of equipment and location of equipment;
b) Number of equipment available or installed;
c) Serial number of the equipment;
d) Type and class of the equipment;
e) Date of procurement/installation of the equipment;
f) Name of manufacturer with address and telephone No.;
g) Name of servicing firm with address and telephone number;

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h) Service manuals;

j) Calibration records, wherever applicable;

k) Major overhauls: Details of date, nature of cost; and

m) Due date of next overhaul.

The records of all maintenance performed shall be maintained.

NOTE — Manual on Water Supply and Treatment, published by CPHEEO, Ministry of Housing and Urban Affairs may be referred while preparing the risk assessment and mitigation plan.

7.1.4 *Environment for the Operation of Processes*

The water supplier/utility shall determine, provide and maintain the environment as well as hygienic condition necessary for the operation of its processes and to achieve conformity of drinking water as per the acceptable limits stipulated in IS 10500 till customer point.

The water supplier/utility shall ensure the safety of its manpower and shall periodically assess the safety measures.

NOTE — A suitable environment can be a combination of human and physical factors, such as:

a) social (non-discriminatory, calm, non-confrontational);

b) psychological (stress-reducing, burnout prevention, emotionally protective); and

c) physical (temperature, heat, humidity, light, airflow, hygiene, noise).

These factors can differ substantially depending on the products and services provided.

7.1.5 *Monitoring and Measuring Resources*

7.1.5.1 *General*

The water supplier/utility shall determine and provide the resources needed to ensure valid and reliable results when monitoring or measuring is used to verify the conformity of services to requirements.

Physical security measures of water supplier/utility shall be planned. Adequate measures for surveillance of drinking water quality during storage and distribution system shall be instituted.

The water supplier/utility shall ensure that the resources provided,

a) are suitable for the specific type of monitoring and measurement activities being undertaken, and;

b) are maintained to ensure their continuing fitness for their purpose.

The water supplier/utility shall retain appropriate documented information as of fitness for purpose of the monitoring and measurement resources.

7.1.5.2 *Measurement traceability*

When measurement traceability is a requirement, or is considered by the water supplier/utility to be an essential part of providing confidence in the validity of measurement results, measuring equipment shall be:

a) Calibrated or verified, or both, at specified intervals, or prior to use, against measurement standards traceable to international or national measurement standards; when no such standards exist, the basis used for calibration or verification shall be retained as documented information;

b) identified in order to determine their status, and;

c) safe guarded from adjustments, damage or deterioration that would invalidate the calibration status and subsequent measurement results.

The water supplier/utility shall determine if the validity of previous measurement results have been adversely affected when measuring equipment is found to be unfit for its intended purpose, and shall take appropriate action as necessary.

7.2 Competence

The water supplier/utility shall,

a) determine the necessary competence of person(s) doing work under its control that affects the performance and effectiveness of the piped drinking water supply service management system;

b) ensure that these persons are competent on the basis of appropriate education, training, or experience;

c) where applicable, take actions to acquire the necessary competence, and evaluate the effectiveness of the actions taken; and

d) retain appropriate documented information as evidence of competence.

NOTE — Applicable actions can include, for example, the provision of training to, the mentoring of, or the reassignment of currently employed persons; or the hiring or contracting of competent persons.

7.3 Awareness

The water upplier/utility shall ensure that the workforce under the water supplier/utility's control are aware of,

a) their policy;

b) relevant objectives;

c) their contribution to the effectiveness of the management system, including the benefits of improved performance; and

d) the implications of not conforming with the requirements of drinking water managements system.

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7.4 Communication

The water supplier/utility shall determine the internal and external communications relevant to the piped drinking water supply service management system, including,

a) on what it will communicate;
b) when to communicate;
c) with whom to communicate;
d) how to communicate; and
e) who communicates.

7.5 Documented Information

7.5.1 *General*

The water supplier/utility's management system shall include,

a) documented information required by this standard; and
b) documented information determined by the water supplier/utility as being necessary for the effectiveness of piped drinking water supply service management system.

7.5.2 *Creating and Updating*

When creating and updating documented information, the water supplier/utility shall ensure appropriate,

a) identification and description (for example, a title, date, author, or reference number);
b) format (for example language, software version, graphics) and media (for example paper, electronic); and
c) review and approval for suitability and adequacy.

7.5.3 *Control of Documented Information*

7.5.3.1 Documented information required by the piped drinking water supply service management system and by this standard shall be controlled to ensure,

a) the availability and suitability for use, wherever it is needed; and
b) that it is adequately protected (for example, from loss of confidentiality, improper use, or loss of integrity).

7.5.3.2 For the control of documented information, the water supplier/utility shall address the following activities, as applicable,

a) distribution, access, retrieval and use;
b) storage and preservation, including preservation of legibility;
c) control of changes (that is, version control); and
d) retention and disposition.

Documented information of external origin determined by the water utility/supplier to be necessary for the planning and operation of the piped drinking water supply service management system shall be identified as appropriate.

Documented information retained as evidence of conformity shall be protected from unintended alterations and be controlled.

NOTE — Access can imply a decision regarding the permission to view the documented information only, or the permission and authority to view and change the documented information.

8 OPERATION

8.1 Operational Planning and Control

The water supplier/utility shall plan, implement and control the processes (*see* **4.4**) needed to meet the requirements for the provision of quality of drinking water and related services, and to implement the actions determined in **6**, by:

a) establishing criteria for,
   1) the processes;
   2) the acceptance of products and services;
b) determining the resources needed to achieve conformity to the quality of drinking water and related services requirements;
c) implementing control of the processes in accordance with the criteria; and
d) determining, maintaining and retaining documented information to the extent necessary,
   1) to have confidence that the processes have been carried out as planned; and
   2) to demonstrate the conformity of products and services to their requirements.

8.2 Requirements for Piped Drinking Water and Related Services

8.2.1 *Customer Communication*

8.2.1.1 Communication with customers shall include,

a) providing information relating to piped drinking water and associated services;
b) handling;
c) available provisions for registering complaints about the piped water supply services;
d) obtaining customer feedback relating to piped drinking water and associated services, including customer complaints; and
e) details of establishing specific requirements for contingency actions, when relevant.

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8.2.1.2 The water supplier/utility shall maintain documented information on redressal of complaint with specified timelines.

The complaint and request methods may include,

a) telephone/IVRS;
b) e-mail or sms;
c) facsimile;
d) written or verbal by visit or otherwise of the user;
e) written or verbal by visit of employees of the water utility;
f) social media; and
g) water utility's own app

NOTE — Any event which may adversely affect the services, along with the appropriate timeline for resumption of the service shall be communicated to the customer through print media or any other means.

8.2.2 *Determining the Requirements for Piped Drinking Water Quality and Related Services*

When determining the requirements for the piped drinking water and related services to be offered to customers, the water supplier/utility shall ensure that,

a) the requirements for the drinking water and related services are defined, including,
   1) any applicable statutory and regulatory requirements; and
   2) those considered necessary by the water supplier/utility;
b) the water supplier/utility can meet the claims for the products and services it offers.

8.3 Changes to Requirements for Drinking Water Quality and Related Services

The water supplier/utility shall ensure that relevant documented information is amended, and that relevant persons are made aware of the changed requirements, when the requirements for drinking water quality and related services are changed.

8.4 Control of Externally Provided Processes, Products and Services

8.4.1 *General*

The water supplier/utility shall ensure that externally provided processes, products and services conform to requirements.

The water supplier/utility shall determine the controls to be applied to externally provided processes, drinking water and related services when,

a) piped drinking water and related services from external providers are intended for incorporation into the water supplier/utility's own drinking water and related services;
b) piped drinking water and related services are provided directly to the customer(s) by external providers on behalf of the water supplier/utility; and
c) a process, or part of a process, is provided by an external provider as a result of a decision by the water supplier/utility.

The water supplier/utility shall determine and apply criteria for the evaluation, selection, monitoring of performance, and re-evaluation of external providers, based on their ability to provide processes or products and services in accordance with requirements. The water supplier/utility shall retain documented information of these activities and any necessary actions arising from the evaluations.

8.4.2 *Type and Extent of Control*

The water supplier/utility shall ensure that externally provided processes, drinking water and related services do not adversely affect the water supplier/utility's ability to consistently deliver conforming drinking water and related services to its customers.

The water supplier/utility shall,

a) ensure that externally provided processes remain within the control of the piped drinking water service management system;
b) define both the controls that it intends to apply to an external provider and those it intends to apply to the resulting output;
c) take into consideration:
   1) the potential impact of the externally provided processes, drinking water and related services on the water supplier/utility's ability to consistently meet customer and applicable statutory and regulatory requirements; and
   2) the effectiveness of the controls applied by the external provider.
d) determine the verification, or other activities, necessary to ensure that the externally provided processes, drinking water and related services meet requirements.

8.4.3 *Information for External Providers*

The water supplier/utility shall ensure the adequacy of requirements prior to their communication to the external provider.

The water supplier/utility shall communicate to external providers its requirements for,

a) the processes, drinking water quality and related services to be provided;
b) the approval of,
   1) drinking water quality and associated services;
   2) methods, processes and equipment; and
   3) the release of drinking water and related services.

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c) competence, including any required qualification of persons;

d) the external providers' interactions with the water supplier/utility;

e) control and monitoring of the external providers' performance to be applied by the water supplier/utility; and

f) verification or validation activities that the water supplier/utility, or its customer, intends to perform at the external providers' premises.

8.5 Production and Service Requirements

8.5.1 *General*

The water supplier/utility shall implement production and service provision under controlled condition. The related activities and responsibilities of the water supplier/utility are listed below,

a) operations, including, extraction, transmission, treatment and distribution of water;

b) maintain operational efficiency;

c) inspection, repairing, leak management and rehabilitation;

d) Monitoring of the quality and quantity of source water, treated water and residue;

e) troubleshooting (during and outside normal hours of work);

f) the safe transportation and disposal/reuse of residues;

g) supply and demand gap assessment;

h) ensuring that the non-revenue water (NRW) shall only be up to 20 percent; and

j) providing alternate supply of water in case of disruption in regular piped water supply service beyond 36 h.

A documented procedure shall be maintained for collection, treatment and distribution of water. This documented procedure shall include criteria of acceptance of drinking water and related services, routine tasks, checks and inspections at specified intervals and locations.

8.5.2 *District Metering Area (DMA)*

District Metering Area (DMA) concept may be adopted for continuous supply of piped drinking water (*see* Annex C for details on the size and design of DMA).

8.5.3 *Water Source*

The quality of water at source/intake shall be monitored by the water supplier/utility and in case of significant adverse changes found in the raw water quality, with respect to the designed parameters, necessary corrective actions shall be taken by the water supplier/utility, and the documented information shall be retained.

Major source of water may be groundwater or surface water. Surface water sources include streams, rivers, lakes or reservoirs. Groundwater is water contained within the geological formations accessed by springs, wells or boreholes. Other possible sources of water are seawater, and rainwater.

NOTE — In case of ground water, the compliance of 'Guidelines to Regulate and Control Ground Water Extraction in India' issued by Central Ground Water Authority, or the guidelines issued by the State/UT government from time to time shall be ensured.

Whenever, the quality of treated water is found to be not in conformity with the acceptable limit of IS 10500 for the tested parameters, the water at source shall be checked again for such parameters to decide the necessary controls to be exercised for ensuring the conformity of processed water to the acceptable limits of IS 10500.

In case non-conformity is observed for radioactive substances, the source of water shall be abandoned and necessary action shall be taken immediately.

8.5.4 *Intake of Raw Water and its Transportation*

The water supplier/utilities shall have the water intake system which normally requires pumping stations to abstract water from the ground, or surface as source, and to transmit the water to the water treatment facility, if any. Instead of pumping, use of gravity fed transport systems should be preferred, wherever feasible.

The transmission mains shall have in-system storage reservoirs at the treatment facility. To protect the water from microbiological contamination, disinfection systems shall be used.

8.5.5 *Treatment of Raw Water*

The water supplier/utility shall plan and carry out the water treatment in such a manner that the drinking water after the necessary treatment shall conform to the acceptable limits of IS 10500 and documented information shall be retained. The water treatment plan and its implementation shall be documented.

NOTE — Manual on Water Supply and Treatment, published by CPHEEO, Ministry of Housing and Urban Affairs as well as the guidelines issued by the State/UT government from time to time may be referred while planning and designing water treatment plant.

8.5.6 *Storage, Transportation and Distribution*

The storage, transportation and distribution system shall be planned and operated in such a manner that it shall not contaminate (physical, chemical, bacteriological or biological, heavy metals or pesticides) the drinking water. Disinfection boosting or dosage enhancing facilities shall be installed to ensure the safety of the drinking water to be delivered.

The distribution system shall have storage reservoirs located at key points to take advantage of natural physical topography, or for reasons of balancing

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supply and demand or for emergency situations. In the absence of an advantageous natural topography, critical points shall be selected in a given distribution system for monitoring of pressures by installation of pressure recorders and gauges. These pressures are either measured manually and transmitted to the control station or automatically measured and transmitted by telemetry to control station. Pumping stations or booster, if necessary, shall be provided to maintain adequate pressure throughout the distribution system. Valves and meters and other appurtenances shall be installed throughout the distribution system as control devices and for water audit.

Water supplier/utility shall maintain a documented procedure for the same.

NOTES

1 Water supplier/utility shall ensure cleaning of storage and service reservoir as per the procedure laid down in the Manual published by Central Public Health and Environmental Engineering Organization (CPHEEO), Ministry of Housing and Urban Affairs, Govt of India

2 Emphasis may be given to operate the systems on automation mode with SCADA application.

The water supplier/utility shall ensure that water supplied to the people, after the necessary treatment shall conform to the acceptable limits specified in IS 10500 and documented information shall be retained.

8.5.7 *Water Audit*

Water audit shall be conducted annually and documented. The report shall be submitted to top management for review and further necessary action.

The effort shall be made by the water supplier/utility to bring down the non-revenue water (NRW) up to 20 percent of the water supplied in the piped water supply system. All components of the water balance shall be quantified over the same designated period, and expressed in KLD or MLD.

A guideline for conducting the water audit has been given at Annex B.

NOTE — The requirement of water audit may not be applicable where metering is not provided.

8.5.8 *Metering*

The water supplier/utility shall provide bulk water meters in the water distribution system to ensure water audit. Provision may also be made to have a functional/ automatic/smart meter at household level, which shall support in water audit. Automatic/smart meters shall be preferred over conventional meters for DMA.

8.6 Release of Piped Drinking Water and Sampling

8.6.1 The water utility/services shall plan and implement control and monitoring systems, at appropriate stages, to ensure that the drinking water shall conform to the acceptable limits of IS 10500 at customer point of distribution.

8.6.2 The water supplier/utility shall prepare and implement the schedule for frequency and monitoring of water quality systems, at appropriate stages including at production site, at distribution system and at the customer point to ensure that the drinking water being supplied conforms to the acceptable limits of IS 10500 at customer end. Wherever contamination of water is suspected, random sampling shall be done by water supplier/utility or on demand by the customer. The details of control being exercised by water utility/ services shall be documented. The Advisory/Guidelines issued by the Government of India from time to time shall be followed by the water supplier/utility.

8.6.3 The release of drinking water to the customer shall not proceed until the control points have been satisfactorily completed, unless otherwise approved by a relevant authority and, as applicable. The authority for such approval shall be designated by water supplier/utility.

9 PERFORMANCE OF WATER SUPPLIER/ UTILITY

9.1 Monitoring, Measurement, Analysis and Evaluation

9.1.1 *General*

The water supplier/utility shall determine,

a) what needs to be monitored and measured;
b) the methods for monitoring, measurement, analysis and evaluation needed to ensure valid results;
c) when the monitoring and measuring shall be performed; and
d) when the results from monitoring and measurement shall be analyzed and evaluated.

The water supplier/utility shall evaluate the performance and the effectiveness of the drinking water supply service management system.

The water supplier/utility shall retain appropriate documented information as evidence of the results.

NOTE — The monitoring of the water utility system may be followed as per the Manual on Operation and Maintenance of Water Supply System, published by CPHEEO.

9.1.2 *Customer Satisfaction*

The water supplier/utility shall monitor customers' perceptions of the degree to which their needs and expectations have been fulfilled. The water supplier/ utility shall conduct surveys, obtain feedback on the service provided, meetings with customer to monitor customers' perceptions of the degree to which their needs and expectations have been fulfilled. The water supplier/utility shall determine the procedure for obtaining, monitoring and reviewing this information.

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The general feedback obtained from the customer may include the following points:

a) Whether supply is continuous or intermittent;
b) Whether adequate pressure is being provided or not;
c) Whether maintenance service is regular or not;
d) Whether adequate warning is being provided in case of disruption of service or not;
e) Average time taken to resume service;
f) Quality of water;
g) Behaviour of the workforce with the customer; and
h) Efficiency of compliant handling/redressal.

9.1.3 *Analysis and Evaluation*

The water supplier/utility shall analyze and evaluate appropriate data and information arising from monitoring, measurement and evaluation.

The results of analysis shall be used to evaluate:

a) Conformity of drinking water quality and related services;
b) Degree of customer satisfaction;
c) Performance and effectiveness of the piped drinking water supply service management system;
d) Effective implementation of planning;
e) Need for improvements to the piped drinking water supply service management system; and
f) Effectiveness of actions taken to address risks and opportunities.

The water supplier/utility shall document performance indicators to assess and improve the services.

NOTE — Service Level Benchmark as Performance Indicator published by the Ministry of Housing and Urban Affairs, Govt. of India or any relevant guidelines issued by the State/UT government may also be referred.

9.2 Internal Audit

9.2.1 The water supplier/utility shall conduct internal audits at planned intervals to provide information on whether the management system:

a) conforms to,
   1) the water supplier/utility's own requirements for its management system; and
   2) the requirements of this standard;
b) is effectively implemented and maintained.

9.2.2 The water supplier/utility shall,

a) plan, establish, implement and maintain an audit programme(s) including the frequency, methods, responsibilities, planning requirements and reporting, which shall take into consideration the importance of the processes concerned, changes affecting the water supplier/utility, and the results of previous audits;
b) define the audit criteria and scope for each audit;
c) select auditors and conduct audits to ensure objectivity and the impartiality of the audit process;
d) ensure that the results of the audits are reported to relevant management;
e) take appropriate correction and corrective actions without undue delay; and
f) retain documented information as evidence of the implementation of the audit programme and the audit results.

NOTE — ISO 19011 may be referred for guidance

9.3 Management Review

9.3.1 *General*

Top management shall review the water supplier/utility's services at planned intervals, to ensure its continuing suitability, adequacy, effectiveness and alignment with the strategic direction of the water supplier/utility.

9.3.2 *Management Review Inputs*

The management review shall be planned and carried out considering the following:

a) Status of actions from previous management reviews;
b) Changes in external and internal issues that are relevant to the piped drinking water supply management system;
c) Information on the performance and effectiveness of the management system, including trends in:
   1) customer satisfaction and feedback from relevant interested parties;
   2) the extent to which their objectives have been met;
   3) process performance and conformity of products and services;
   4) nonconformities and corrective actions and measures;
   5) monitoring and measurement results;
   6) audit results; and
   7) the performance of external resources;
d) Adequacy of resources;
e) Effectiveness of actions taken to address risks and opportunities; and
f) Opportunities for improvement.

9.3.3 *Management Review Outputs*

The outputs of the management review shall include

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decisions and actions related to,

a) opportunities for improvement;
b) need for reform to the management system; and
c) resource needs.

The water supplier/utility shall retain documented information as evidence of the results of management reviews.

10 IMPROVEMENT

10.1 General

The water supplier/utility shall determine and select opportunities for improvement and implement any necessary actions to meet customer requirements and enhance customer satisfaction.

These shall include, but not limited to, the following:

a) Improving services to meet requirements as well as to address future needs and expectations of piped drinking water supply service management system;
b) Correcting, preventing or reducing undesired effects;
c) Risk assessment for reducing undesired effects; and
d) Improving the performance and effectiveness of the piped drinking water supply service management system.

10.2 Non-Conformity and Corrective Action

10.2.1 When a non-conformity occurs, including any arising from complaints, drinking water supplier/utility shall,

a) react to the non-conformity, as applicable.
    1) take immediate action to control and correct it;
    2) contain, or suspend the provision of drinking water;
    3) inform the customer as well as the top management;
    4) obtain authorization for acceptance under concession; and
    5) provide alternate source of water
b) evaluate the need for action to eliminate the cause(s) of the non-conformity, in order that it does not recur or occur elsewhere, by:
    1) reviewing and analyzing the non-conformity;
    2) determining the causes of the non-conformity; and
    3) determining, if similar non-conformities exist, or could potentially occur;
c) implement the required action needed;
d) review the effectiveness of corrective action taken;
e) update risks and opportunities determined during planning, if necessary; and
f) make changes to the management system, if necessary. Corrective actions shall be appropriate to the effects of the non-conformities encountered.

10.2.2 The water supplier/utility shall retain documented information as evidence of,

a) the nature of the non-conformities and any subsequent actions taken; and
b) the corrective actions adopted and their result.

The water utility shall identify the authority deciding the action in respect of the non-conformity

10.3 Continual Improvement

The water supplier/utility shall continuously make efforts to improve the suitability, adequacy and effectiveness of the piped drinking water supply service management system.

The water supplier/utility shall consider the results of analysis and evaluation, and the outputs from management review, to determine the needs or opportunities that shall be addressed as part of continual improvement of the services, workforce, equipment and machineries.

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ANNEX A

(*Clause* 6.1.3)

DISASTER MANAGEMENT

A-1 DISASTER PREPAREDNESS

The natural disasters may occur due to earthquake, floods, cyclone, draught, tsunami, landslides and avalanches; and anthropogenic disasters such as nuclear, chemical, biological, explosions, act of sabotage and terrorism. Consequence of such disasters could be life threatening and debilitating in the long run. Also, anthropogenic or natural disasters can trigger combined form of progressive disasters.

A-2 APPROACH

The approach to disaster mitigation and management should be holistic and integrated with emphasis on prevention, mitigation and preparedness rather than being relief centric. The approach should emphasize on preparedness through planning, protection, training and partnership measures with associated stakeholders. These efforts are aimed to protect and conserve existing development and also to minimize losses to lives, livelihood, infrastructures and property with clear cut focus on protection of environment.

The risks due to disaster management should be a part of design development, construction practices and management, operation and maintenance of infrastructures. The required awareness should be achieved through multi-stakeholder based planning, awareness, displays, mock drills and adequate training to both aged and young.

The disaster mitigation should also comprise identification of risks during construction, occupancy stages/operations and preparing disaster preparedness plan.

A-3 DISASTER RISK ASSESSMENT AND MITIGATION

The formulation of disaster preparedness plan for any location should comprise the following steps:

a) *Step* 1 — Identify the geomorphology; river, coastal and cyclonic proximity; and climatic zone related disasters risks.

b) *Step* 2 — Identify population, business related disasters and vulnerabilities.

c) *Step* 3 — Carry out risk assessment through Hazard Analysis (HAZAN) and Hazard and Operability (HAZOP) study and vulnerability analysis including possible combining effects of multiple hazards. Also include the effect on micro-climate and environment biodiversity. Coastal zones which are falling in high cyclonic flood zone, tsunami, seismic zones of high intensity and landslide sensitive areas should receive special attention.

d) *Step* 4 — Identify the socio-economic, socio-political hazards and vulnerabilities attributed to anthropogenic disasters.

e) *Step* 5 — Prepare a disaster risk mitigation plan supported with sufficient budgetary provisions.

f) *Step* 6 — The disaster resistant building construction and infrastructure development features shall form part of the submittal to the authority for statutory approvals.

g) *Step* 7 — Nominate a senior person/safety officer as controller for regulating, planning and monitoring disaster preparedness plan for entire system/project. Carry out all constructions, installations and operations in line with the disaster resistant features for each of the vulnerabilities.

h) *Step* 8 — Prepare an evacuation plan and have mock drills at regular intervals for creating awareness and response preparation amongst stakeholders involved.

j) *Step* 9 — Prepare operation manual for post-construction operation and up keep of disaster resistant features and equipment. The basic action plan shall focus on capacity building amongst stakeholders involved, communication, co-ordination, role of information technology, role of every individual working at site and role of emergency response cell in conjunction with the mitigation plans of local/state level authorities. The possible after-effects on human and natural habitats and mitigation plan shall form integral part of disaster preparedness plan for least damage to human life, built environment and related eco-systems.

A-4 POST DISASTER ACTIONS

a) Line up and schedule emergency operations;

b) Notify State and Central Agencies of location and telephone numbers of the emergency operating center or control command centre for the utility;

c) Necessary alternate arrangement to be made for emergency water supply, if necessary;

d) Notify and set up clear lines of communication with local authorities, such as police and fire;

e) Make arrangements with the local power utility to be prepared to disconnect power to the plant and to restore power after disaster as quickly as possible as a primary customer;

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f) Make necessary arrangements with local companies to repair the damaged machineries in the system immediately so as to ensure water supply at the earliest;

g) Make arrangements with local companies to ensure that the plants are safe and put in operation as soon as possible; and

h) To arrange adequate inventory of requisite workforce material and equipment reserved to meet the exigencies.

ANNEX B

(*Informative only*)

(*Clause* 8.5.7)

GUIDELINES FOR CONDUCTING WATER AUDIT

B-0 A water audit has two components: 1) system appraisal, and 2) water balance calculation.

B-1 SYSTEM APPRAISAL

The purpose of the system appraisal is to review,

a) Country/Regional characteristics (like influencing factors, components of water loss);

b) Current practice and methodologies;

c) Level of technology (accuracy and reliability of meters/equipment in place, need for temporary meters, placement of valves, pipeline materials, pump and motors, etc);

d) Skills and capabilities of staff; and

e) The company's data and methodology for the water balance calculation.

The system appraisal shall include,

1) Discussions with top management on current management practice, perceptions, financial and political constraints, influences, and future planning;

2) Discussions with operational staff on system features and practice, including:

i) physical data (population, demands, topography, supply arrangements);

ii) drawings and records, billing data;

iii) estimates of total water loss;

iv) estimates of leakage and other water loss components (illegal connections);

v) current practice (staffing structure, staff numbers and skills);

vi) techniques and equipment;

vii) repair programme; and

viii) economic data (cost of production, etc).

3) Field visits to appraise current practice and skills; and

4) Selection of a suitable pilot area for a future project to demonstrate techniques and equipment, gather results and show benefits, and train staff.

B-2 WATER BALANCE CALCULATION

This is the measurement of distribution input and water consumed.

a) *Distribution input* — This step identifies all water sources and quantifies the water supplied. Measurement is by one or more of the following:

1) existing production (bulk) meters, after checking for accuracy;

2) summation of zone flows where there are existing zone meters;

3) reservoir drop tests;

4) checking of pump curves; and

5) insertion meters at points where there are no meters.

b) *Measured use* — Billing records are used to quantify measured outputs (water quantity) from the system:

1) identify all non-household customers including commercial, institutional, industrial, etc;

2) identify all non-metered customers including above; and

3) identify all household customers.

c) *Unmeasured use* — This step identifies unmetered households and other authorized unmeasured use:

1) estimate use by unmetered households. Monitor a sample of households by meter, or estimate the per capita consumption;

2) identify and estimate unmeasured use by authorized users, for example, municipal buildings, parks, fire services, stand-post, tankers;

3) identify and estimate unmeasured supplies to peri-urban areas (slum areas, squatters, etc); and

4) identify and estimate water used by the company for operational purposes, for example, mains cleaning and flushing.

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d) *Unauthorized use* — This step identifies and estimates illegal supplies and theft,

1) estimate the number of illegal connections from past records and anecdotal evidence of inspectors, or by a house-to-house survey of a sample zone (check that each connection has a billing reference);
2) estimate the number of broken or by-passed meters in the same way;
3) use per capita consumption estimates to calculate the volume used;
4) leakage from reservoirs;
5) overflows from reservoirs;
6) leakage from transmission mains; and
7) leakage in the distribution system.

ANNEX C

(*Clause* 8.5.5)

SIZE AND DESIGN OF DISTRICT METERED AREA (DMA)

C-1 SIZE OF DMA

DMA size is expressed in the number of properties. The size of a typical DMA in urban areas varies between 500 and 3 000 properties/metered connections. However, some DMAs designed around old 'waste meter zones', are smaller than 500 properties/metered connections and others, designed around reservoir zones or in rural areas, are larger than 3 000 properties/ metered connections. The size of an individual DMA may vary, depending on a number of local factors and system characteristics, such as,

a) the required economic level of leakage;
b) geographic/demographic factors (like, urban or rural, residential, commercial, industrial areas, etc);
c) previous leakage control technique (like, ex-waste meter districts);
d) individual water company preference (like, discrimination of service pipe bursts, ease of location survey); and
e) Hydraulic conditions (like, limitations of closing valves in the current network, and the need to maintain standards of service).

C-2 DMAs in dense urban areas, like, inner cities, may be larger than 3 000 properties/metered connections, because of the housing density. In the rural areas it is also difficult to lay down sizing guidelines, as rural DMAs may consist of a single village, or may encompass a cluster of villages (a small number of properties in a large geographical area).

If a DMA is larger than 5 000 properties/metered connections, it becomes difficult to discriminate small bursts (like, service pipe bursts) from night flow data, and it takes longer to locate. However, large DMAs can be divided into two or more smaller DMAs by temporarily closing the valves so that each sub-area is fed in turn through the DMA meter for leak detection activities. In this case, any extra valves required shall be taken into account at the DMA design stage. The record of location of valves and meters shall be properly maintained.

C-3 DESIGN OF DMA

Several factors shall be taken into account when designing a DMA, such as,

a) the required economic level of leakage;
b) size (geographical area and the number of properties);
c) variation in ground level; and
d) drinking water quality considerations.

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ANNEX D

(*Foreword*)

COMMITTEE COMPOSITION

Public Drinking Water Services Sectional Committee, SSD14

Organization	*Representative(s)*
National Water Mission, Department of Water Resources, RD & GR, Ministry of Jal Shakti, New Delhi	Shri Suneel Kumar Arora (***Chairman***)
All India Institute of Hygiene & Public Health, Kolkata	Representative
Bangalore Water Supply & Sewerage Board, Bengaluru	Shri Rajiv K. N.
Central Pollution Control Board, New Delhi	Representative
Central Public Health & Environmental Engineering. Organisation, Ministry of Housing and Urban Affairs, New Delhi	Dr Ramakant
Central Public Works Department, New Delhi	Representative
Chennai Metropolitan Water Supply & Sewerage Board, Chennai	Representative
CSIR — Indian Institute of Toxicology Research, Lucknow	Ms Preeti Chaturvedi Dr Satyakam Patnaik (*Alternate*)
Delhi Development Authority, New Delhi	Representative
Delhi Jal Board, Delhi	Shri V. K. Gupta Shri Virendra Kumar (*Alternate*)
Department of Drinking Water and Sanitation, Ministry of Jal Shakthi, New Delhi	Shri Samir Kumar
Engineers India Limited, Gurugram	Representative
Gujarat Water Supply & Sewerage Board, Gujarat	Representative
Guwahati Metropolitan Drinking Water and Sewerage Board, Assam	Representative
Indian Institute of Technology Delhi, New Delhi	Dr Arun Kumar Dr Arya Vijayanandan (*Alternate*)
Indian Institute of Technology Roorkee, Roorkee	Dr Zulfequar Ahmad Dr K. S. Hari Prasad (*Alternate*)
Indian Water Works Association, New Delhi	Shri Kanwarjit Singh Shri R. S. Tyagi (*Alternate*)
Jal Nigam, Uttar Pradesh	Representative
Krishna Bhagya Jala Nigam Limited, Karnataka	Representative
Maharashtra Jeevan Pradikaran, Thane	Representative
Military Engineer Services, New Delhi	Shri Padmanabh Maniyar, IDSE
Ministry of Environment, Forest and Climate Change, New Delhi	Dr Dharmendra Kumar Gupta Dr Bhawna Singh (*Alternate*)
Ministry of Housing & Urban Affairs, New Delhi	Representative

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Organization	*Representative(s)*
Municipal Corporation of Greater Mumbai, Mumbai	Representative
National Environmental Engineering Research Institute, Nagpur	Dr Pawan Labhasetwar Dr Pranav Nagar Naik (*Alternate*)
National Institute of Hydrology, Roorkee	Dr Mukesh Kumar Sharma Dr Rajesh Singh (*Alternate*)
National Test House, Kolkata	Dr S. N. Bandyopadhyay Dr A. B. Mondal (*Alternate*)
Public Health Engineering Department, Bihar	Representative
Public Health Engineering Department, West Bengal	Shri Hemanta Koley Shri Soumitra Chakraborty (*Alternate*)
Public Health Engineering Department, Rajasthan	Representative
Quality Council of India, New Delhi	Ms Aparna Dhawan Ms Anuja Anand (*Alternate*)
Saviram Engineering Consultants Pvt Ltd, Noida	Shri Girish Mishra
Tata Consulting Engineers Limited, New Delhi	Representative
Tata Consultancy Services, Mumbai	Representative
The Energy and Resources Institute, New Delhi	Representative
The Institution of Engineers (India), Delhi	Shri J. C. Singhal
Uttarakhand Jal Sansthan, Dehradun	Ms Neelima Garg
VIMTA Labs, Hyderabad	Shri Jagadeesh Kodali Shri M. Janardhan (*Alternate*)
Voluntary Organization in Interest of Consumer Education (VOICE), New Delhi	Shri B. K. Mukhopadhyay Shri K. C. Choudhry (*Alternate*)
WAPCOS Limited, New Delhi	Shri Rajat Jain
In personal capacity (*118, Farmers Society, Sec 13 , Rohini, Delhi - 110085*)	Shri V. K. Gupta
In personal capacity (*C/o "A" Mess, Near Div Chowk, Durpin Dhara, Kalimpong, West Bengal)*	Col A. K. Chaubey
BIS Directorate General	Shri S. K. Kanogia, Scientist 'E' and Head (Service Sector Dept II) [Representing Director General (*Ex-officio*)]

Member Secretary

Ms Divya S.
Scientist 'C' (Service Sector Dept II), BIS

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Panel for drafting standard on Piped Drinking Water Supply Service, SSD 14/P2

Organization	*Representative(s)*
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CSIR — Indian Institute of Toxicology Research, Lucknow	Ms Preeti Chaturvedi
Indian Institute of Technology Roorkee, Roorkee	Dr Zulfequar Ahmad
Indian Water Works Association, New Delhi	Shri R. S. Tyagi
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