BUREAU OF INDIAN STANDARDS

**DRAFT STANDARD**

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*Draft Indian Standard*

**Drinking Water Supply System – Disaster Management**

*ICS 13.060.0*

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| Drinking Water Supply, Wastewater and Stormwater System Service Sectional Committee, SSD 14 | Last Date of Comments:**—** |

# Foreword

(*Formal clauses may be added later*)

Water supply are vital for the health and development of any community. The main objective of drinking water utility/supplier, therefore, must be to maintain systems that qualitatively and quantitatively meet the needs of the population so that interruptions in the supply of drinking water are as brief as possible. Given the negative effects that different phenomena may have on water supply such as the rupture and dislocation of mains and distribution pipes, the contamination of springs or damage to treatment facilities, mitigation and prevention are very important. It is imperative to capable of resolving, in the best fashion and the shortest time possible, the problems that may arise during and after the impact of disasters.

Disasters are mostly caused by natural phenomena, even if many of their consequences must be attributed to human actions or negligence. In order to control or minimize natural hazards, it is essential to know the characteristics of common adverse natural phenomena and how they impact on our environment. The study and proper management of such hazards is also a prerequisite for developing operational, planning, training and simulation programs. These actions comprise several stages:

1. Becoming familiar with, analyzing, and assessing the presence of natural hazards and their effect on the equipment and infrastructure of the area under study, based on the vulnerability associated with such phenomena;
2. Estimating the potential impact of natural hazards on routine as well as longer-term development activities, and on the components of drinking water supply systems;
3. Devising and adopting measures to reduce vulnerability and mitigate the effects of hazards;
4. Programming emergency operations.

This standard describes the fundamentals of a disaster management system, including relevant recommendations for drinking water utilities. This standard deals with situations where the normal supply of potable water is interrupted because of a disaster situation. It enumerates steps that should be taken in preparing the drinking water utility/supplier for a disaster situation.

The approach of drinking water utilities when preparing for any disaster should encompass all pertinent aspects of water supply. The drinking water utilities needs to cooperate with all relevant authorities concerned with the disaster. Efficient disaster management should ensure that the actions taken before, during, and after the disaster should consider the natural environment as well as the impact on the health and wellbeing of the population. Effective communications with the public are necessary to mitigate or prevent panic and to establish trust in the drinking water utilities by disclosing important information appropriately in the area affected by a disaster or in adjacent areas.

In the formulation of this standards assistance were taken from

1. ISO 9000
2. IS/ISO 24518: 2015 — Activities Relating to Drinking Water and Wastewater Services — Crisis Management of Water Utilities;
3. Preparing for disasters — urban flooding, drought, water scarcity, etc. by RS Tyagi.

Drinking Water Supply System ―
Disaster Management

# 1 SCOPE

Thisstandard specifies the requirements for disaster management system in drinking water system including pre disaster, onset disaster , and post disaster measures

NOTE — This standard may be applicable to all sizes of public and private drinking water utility/supplier that want to prepare, respond, and recover from any natural or manmade disasters.

# 2 RERERENCES

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

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| *IS No.* | *Title* |
| IS 10500 : 2012 | Drinking Water – Specifications (second revision) |
| IS/ISO 45001 : 2018  | Occupational Health and Safety Management Systems – Requirements with Guidance for Use |

# 3 TERMS AND DEFINITIONS

For the purpose of this standard, the definitions given in IS 17482 and the following shall apply

**3.1** **Alternative Water Supplies (AWS) —** Water provided to customers by means other than through the normal treatment and distribution system conforming to acceptable limits of IS 10500.

**3.2 Audit —** Systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled.

**3.3 Competence** — Ability to apply knowledge and skills to achieve intended results.

**3.4 Continual improvement —** Recurring activity to enhance performance.

**3.5 Corrective action —** Action to eliminate the cause of a nonconformityand to prevent recurrence.

**3.6 Disaster**

The disasters may be natural disasters such as drought, earthquake, floods, heat waves, cold waves, thunderstorm, lightning, cloudburst, hailstorm, cyclone, tsunami, landslides and avalanches; and man-made disasters such as nuclear, chemical, biological, and radiological disasters, explosions, fire, act of sabotage and terrorism. Consequence of such disasters could be life threatening and debilitating in the long run. Also, man-made or natural disasters can trigger combined form of progressive disasters.

**3.7 Disaster management system —** The set of people, procedures, information etc. to deal with management of resources and responsibilities for handling the disaster situation in terms of preparedness, measures, response, and recovery.

**3.8** **Disaster management committee —**

A committee formed by the top management consisting of personnel drawn from multidisciplinary areas to provide planning, operation, and logistics related directions to the drinking water utility/supplier in accordance with disaster management system laid by the top management.

**3.9 Drinking Water** — Water to be used for drinking purpose that is conforming to acceptable limit of IS 10500.

**3.10 Drinking Water Supply Services —** The services provided by the drinking water utility/supplier which includes extracting, transporting, treating, and distributing drinking water to the customer meeting the specified requirements.

**3.11Drinking Water Supply System** — A tangible component consisting of abstracting, transporting, treating the raw water and distributing the drinking water to the consumer by the drinking water utility/supplier.

**3.12 Drinking Water Utility/Supplier —** Whole set of a society or a body or an organization dealing with the supply of drinking water and has one or all processes, activities, means and resources necessarily for abstracting, transporting, and treating the raw water and distributing the drinking water and providing the associated services including risk and disaster management.

**3.13 Emergency Response team/cell**

A Team/Cell of persons within the drinking water utility/supplier authorized/engaged by the top management, are suitably skilled and have experience to perform task under disaster situation, consists of Information & Media Officer (IMO), Safety Officer (SO) and Liaison Officer (LO) and headed by Incident Commander (IC), The main function of the Emergency Response Team/Cell is to assist the IC in the discharge of his functions laid by the top management.

**3.14 Documented information —** Information required to be controlled and maintained by the drinking water utility/supplier.

**3.15 Effectiveness** — Extent to which planned activities are realized and planned results achieved.

**3.16 Emergency Response plan —** Document specifying which procedures and associated resources should be applied by whom and where to a particular type of disaster.

**3.17 Interested party —** Stakeholder person that can affect, be affected by, or perceive themselves to be affected by a decision or activity of the drinking water utility/supplier.

**3.18 Incident Commander (IC) —** The IC is the overall in-charge for the management of onsite response to any incident/disaster appointed by the top management. For his assistance and management of the incident/disaster there are Information & Media Officer (IMO), Safety Officer (SO), and the Liaison Officer (LO).

### **3.19 organization —** person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives.

NOTES — The concept of organization includes, but is not limited to, sole-trader, company, corporation, firm, enterprise, authority, partnership, charity or institution, or part or combination thereof, whether incorporated or not, public or private.

**3.20 Outsource —** Arrange where an external organization performs part the drinking water utility/supplier function or process.

**3.21** **Policy —** Intentions and direction of a drinking water utility/supplier as formally expressed by its top management.

NOTE — For guidance on policy refer IS 17482.

**3.22 Performance —** Measurable result.

**3.23 Process —** Set of interrelated or interacting activities which transforms inputs into outputs.

**3.24 Recovery —** The provision of policies, procedures and processes that are necessary to restore operations critical to the resumption of service.

**3.25 Safety Audit —** A systematic, objective, documented and independent evaluation to determine whether, the activities conform to the requirements of the safety systems and procedures.

**3.26 Top management —** Person or group of people who directs and controls a drinking water utility/supplier at its highest level.

**4 DISASTER MANAGEMENT IN DRINKING WATER UTILITY/SUPLLIER**

## **4.1 Understanding the Drinking Water Utility/Supplier and its Context**

The top management shall determine external and internal issues that are relevant to the purpose and that affect the ability of the drinking water utility/supplier to achieve the intended outcome(s) of its disaster management system. The top management 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 utility/supplier.

## **4.2 Understanding the Needs and Expectations of Interested Parties**

The top management shall determine the following:

1. the interested parties that are relevant to the disaster management system;
2. the requirements of these interested parties that are relevant to disaster management;

## **Determining the Scope of the Disaster Management System**

The top management while determining the boundaries and applicability of the disaster management system to establish its scope shall ensure that the:

1. the external and internal issues referred to in [4.1](#_bookmark16) are considered;
2. the requirements referred to in [4.2](#_bookmark17) are considered;
3. scope is consistent with the National, State and District Disaster Management Policy.
4. scope is consistent with the parent policy of drinking water utility/supplier.

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

**4.4 Determining the Objectives of Disaster Management System**

**4.4.1** The top management shall establish disaster management system objectives at relevant functions and levels with following characteristics;

1. consistent with the National, State and District Disaster Management Policy;
2. objectives are consistent with the parent policy of drinking water utility/supplier.
3. measurable (if practicable);
4. take into account applicable requirements;
5. monitored;
6. communicated;
7. updated as appropriate.

**4.4.2** The top management shall document information on the objectives of disaster management system. When planning how to achieve its objectives, the top management shall determine the following:

* 1. what will be done;
	2. what resources will be required;
	3. who will be responsible;
	4. how it will be done;
	5. when it will be completed;
	6. method of evaluation for results.

**4.4.3** Objectives may address the following points but not limited to:

* 1. prioritization of assets and operations for restoration of service taking the criticality of the service or users into consideration;
	2. establishing intermediate restoration objectives and conditions to be achieved;
	3. establishing a target timescale for the restoration of service, while considering levels of service to be achieved during the phases of the disaster;
	4. establishing thresholds at which point pre-determined actions will commence or terminate;
	5. timely and active internal and external communication;
	6. deciding on type and, where applicable, quantities, of alternate water supply such as bottled water, water tankers etc.
	7. provision of support to hospitals, evacuation shelters, homes for the elderly, government and military establishments, persons with special needs to special categories of customers.

## **4.5 Disaster Management System and its Processes**

**4.5.1** The top management shall establish, implement, maintain and continually improve a disaster management system, including the processes needed and their interactions, in accordance with the requirement of this Standard.

**4.5.2** The top management shall determine the processes needed for the disaster management system and their throughout application, and shall:

1. determine the inputs required and the outputs expected from these processes;
2. determine the sequence and interaction of these processes;
3. determine and apply the criteria and methods (including monitoring, measurements and related performance indicators) needed to ensure the effective operation and control of these processes;
4. determine the resources needed for these processes and ensure their availability;
5. assign the responsibilities and authorities for these processes;
6. address the risks and opportunities as determined in accordance with the requirements of 6.2 (risk analysis);
7. evaluate these processes and implement any changes needed to ensure that these processes achieve their intended results;
8. improve the processes and the disaster management system.

NOTE — Further guidance may be taken from Annex A for the process flow of a Disaster Management System.

* 1. **Records**

To the extent necessary, the top management shall,

1. maintain documented information to support the operation of its processes;
2. retain documented information to have confidence that the processes are being carried out as per planned scheduled;
3. maintain the records of the workforce employed and needed, as per schedule; and
4. maintain records to establish traceability of processes causing major/minor non-conformity.
5. **LEADERSHIP**

## **5.1 Leadership and Commitments**

**5.1.1** *General*

The top management shall demonstrate leadership and commitment with respect to the disaster management system by:

1. taking accountability for the effectiveness of the disaster management system;
2. ensuring that the scope and objectives of the disaster management system are established and are compatible with the strategic direction of the drinking water utility/supplier;
3. ensuring the integration of the disaster management system requirements into the drinking water utility/supplier,
4. promoting the use of the process approach and risk-based thinking;
5. ensuring that the resources needed for the disaster management system are available,
6. communicating the importance of effective disaster management system and of conforming to the disaster management system requirements in the drinking water utility/supplier,
7. ensuring that the disaster management system achieves its intended outcome(s),
8. directing and supporting persons to contribute to the effectiveness of the disaster management system,
9. promoting continual improvement, and
10. supporting other relevant management roles to demonstrate their leadership as it applies to their areas of responsibility.

**5.1.2** *Customer Focus*

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

1. customer and applicable statutory and regulatory requirements are determined, understood and consistently met to satisfy the customer;
2. the risks and opportunities that can affect the activities of disaster management system and the ability to enhance customer satisfaction are determined and addressed; and
3. the focus on enhancing customer satisfaction is maintained.
	1. **Communicating the scope and objectives of the disaster management system**

The scope and objectives of the disaster management system shall be

1. available as documented information,
2. communicated within the drinking water utility/supplier,
3. available to interested parties, as appropriate.

## **Structural Response System for Disaster Management**

The top management shall identify and designates officers to perform various duties and get them trained in their respective roles and responsibilities. The top management shall assign following staff for the development of effective response system in its disaster management:

* + 1. Disaster Management Committee: The top management shall constitute disaster management committee to perform planning (tactical actions to meet incident objectives), operation (collection, evaluation and display of incident information, maintaining and tracking resources, preparing the Emergency Operation Plan (EOP) and other necessary incident related documentation), and logistics (providing facilities, services, materials, equipment and other resources in support of the incident response) related task.

NOTE — It is preferable to constitute disaster management committee with members from different sectors related to drinking water utility/supplier such as district disaster management authorities, power sector, transportation sector, meteorological department etc.

* + 1. Emergency Response Team/Cell: For an effective response in disaster situation, the top management shall assign following officer:
			1. Safety Officer (SO): develop and recommend measures for ensuring safety of personnel, and to assess and/or anticipate hazardous and unsafe situations.
			2. Liaison Officer (LO): The LO is the focal point of contact for various line departments, external organization participating in the response.
			3. Information & Media Officer (IMO): prepare and release information about the incident to the media agencies and others with the approval of IC.
			4. Incident Commander (IC): overall in-charge for the management of onsite response to any incident.

NOTE — For further guidance on role and responsibilities of response system, National Disaster Management Guideline on Incident Response System may be referred.

## **Roles, Responsibilities and Authorities of Drinking Water Utility/Supplier**

**5.5.1** Top management shall ensure that the responsibilities and authorities for relevant roles are assigned and communicated within the drinking water utility/supplier.

**5.5.2** Top management shall assign the responsibility and authority to ensure that:

1. their disaster management system conforms to the requirements of this Standard;
2. the processes are delivering their intended output(s).
3. reporting on the performance of the disaster management system;
4. training of individuals from the drinking water utility/supplier
5. **PLANNING**
	1. **Actions to Address Risks and Opportunities**
		1. When planning for disaster management system, the top management shall consider the issues referred to in 4.1 and 4.2, determine and monitor the risks as well as opportunities that need to be addressed to,
6. give assurance that the disaster management system can achieve it’s intended result(s);
7. enhance desirable effects;
8. prevent, or reduce, undesired effects; and
9. achieve improvement.
	* 1. The top management shall plan the actions to address these risks and opportunities and how to integrate and implement the actions into its disaster management system processes and also evaluate the effectiveness of these actions.
		2. Actions taken to address risks and opportunities shall be proportionate to the potential impact on drinking water utility/supplier.
	1. **Risk Identification and Vulnerability Analysis**
		1. *Risk identification*

The top management shall identify natural or manmade hazard associated to the drinking water supply system.

NOTE — For the identification of natural hazard associated in a particular geographical region, the drinking water utility/supplier may refer to different hazard map laid by National Disaster Management Authority or Indian Meteorological Department. The guidance of risk involved in different components of the drinking water utility/supplier that are affected differently by the natural or manmade catastrophes may be taken from Annex B.

* + 1. *Vulnerability analysis*

The top management shall analyze and document potential threats to the drinking water supply system in its vulnerability analysis under following categories:

* + - 1. *Physical*

The top management shall estimate the possible damage to infrastructure components as well as the area that would impact operations of drinking water supply system for every associated risk. For the ease in the analysis, priorities should be selected in the drinking water supply system.

* + - 1. Priority 1 (High): More than 50% of components affected
			2. Priority 2 (Medium): Between 25% and 50% of components affected;
			3. Priority 3 (Low): Less than 25% of components affected;

NOTES

**1** The components should preferably be indicated in the direction of flow of water and must be classified in the following manner: intakes (different types) and their structures, main pipelines, treatment plants, pump stations, storage tanks, and distribution system.

**2** Identify and provide a functional description of the system (flow volume, level, pressure, quality of the service).

**3** Simulate possible events and analyze the expected consequences to the system. These estimates should also include the population, institutions, and environmental elements potentially affected.

* + - 1. *Operational*

The top management shall assess the surplus or remaining capacity to provide the needed services, including an estimate of the time required to rehabilitate the systems. In order to determine operational vulnerability, the top management shall:

1. Identify the system’s operational aspects such capacity, demand, deficit or surplus volume;
2. Quantify the capacity of each component and subsystem to operate in certain conditions, bearing in mind quantity, quality, and continuity to be maintained;
3. Identify the critical components of the drinking water supply system that may affect the drinking water supply system;
	* + 1. *Organizational*

The top management shall determine the response capacity of drinking water utility/supplier, bearing in mind, its expertise, and its other resources. In some cases, it may prove necessary to consider the cultural and socioeconomic characteristics of the community that benefits from the drinking water supply.

* + 1. The top management shall draft the final report and vulnerability maps. Several reports can be produced to cover the various hazards that can affect the system.
	1. **Emergency Operation Plan**

**6.3.1** The disaster management committee shall formulate emergency operation plan that is:

* 1. concurrent with the National, State, and District Disaster Management Plan/Guideline;
	2. specific to each expected disaster;
	3. developed along with risk analysis and vulnerability analysis for specific disasters;
	4. dynamic in nature;
	5. clear, concise, and complete.
	6. categorized as pre-disaster, onset disaster and post-disaster measures;
	7. involves designing a series of activities that are enable to respond promptly and executed properly;
	8. specify function of each person or group involved in the disaster management system based on the existing resources;
	9. updated whenever there is a change in resources, personnel training, or the vulnerability of the system;
	10. prioritize the activities to be carried out and specify a timeframe for completion;
	11. designed with the participation of relevant external organization;
	12. widely disseminated and known by the staff;
	13. incorporate local culture of the region.
		1. The disaster management committee shall specify operations for following three sets of activities to reverse the impact of hazard in the pre-disaster measures:
			1. Prevention
			2. Mitigation
			3. Preparedness
		2. The disaster management committee shall specify the operations of emergency response team/cell after the disaster has occurred that shall include response activities, , relief, and aid to the victims. The onset disaster measure shall be based on:
1. the available manpower and resources in the drinking water utility/supplier that is affected by the disaster; and
2. the procedures, instructions, and necessary information for preparing, mobilizing, and using the resources of drinking water utility/supplier in the most effective manner.

NOTE — With time, as mitigation measures are carried out and equipment is obtained for emergencies, the onset disaster measures shall be modified.

* + 1. The disaster management committee shall prepare post-disaster measures for the rehabilitation and reconstruction of drinking water utility/supplier wherever needed to speed the restoration of these services. With reconstruction, the essential thing is for the drinking water utility/supplier to incorporate prevention and mitigation measures when designing the new construction or retrofitting plans, so as to prevent the same weaknesses the systems had before the disaster.
	1. **Infrastructure Planning**
		1. *Advance technology*

The drinking water utility/supplier shall incorporate advances in information management, technological resources such as geographic information systems (GIS), SCADA etc. into emergency and disaster management in order to have the best possible information available for effective decision-making.

* + 1. *Early warning system*

The drinking water utility/supplier shall install an early warning system that shall have the following characteristics:

detecting and forecasting impending extreme events to formulate warnings on the basis of scientific knowledge and monitoring, and consideration of factors that affect disaster severity and frequency by incorporating coordination with metrological department, frequent water sampling at raw water source, CCTV cameras surveillance etc.;

disseminating warning information, augmented by information on the possible impacts on people and infrastructure from the vulnerability assessment, to the political authorities for further communication to the threatened population, including appropriate recommendations for urgent action; and

emergency response team/cell to communicate the warning to the local authorities, based on a proper understanding of the information, and subsequent implementation of protective measures.

NOTE — Communication throughout the early warning chain must be two-way and interactive. Originators, disseminators and end-users must be in continuing contact with one another in order to make the system responsive to people’s needs, priorities and decisions.

* + 1. *Emergency Water Distribution Site*

In case of dislocation of mass population to a shelter point is expected during a disaster, the drinking water utility/supplier shall plan a proper emergency water distribution sites which shall have following characteristics:

* 1. It shall be an open space, paved surface and accessible by truck;
	2. Electricity and phone service shall be available;
	3. commercial water suppliers such as grocery stores should be avoided as they might create redundancy.
	4. It is recommended to install at distance not more than 1 km from the shelter points.

NOTE — Fire stations, police stations, and other government agencies undertaking emergency response activities are not recommended as distribution sites

* 1. **Planning of Changes**

When the top management determines the need for changes to the disaster management system, the changes shall be carried out in a planned manner. The top management shall consider,

* + 1. the need for the change and the expected gain;
		2. the purpose of the changes and their potential consequences on the drinking water quality and related services;
		3. the integrity of the disaster management system;
		4. the availability of resources; and
		5. the allocation or reallocation of responsibilities and authorities

# SUPPORT

## **Resources**

* + 1. *General*

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

* + - 1. the available internal resources and constraints;
			2. the resources required; and
			3. what needs to be obtained from external providers.

NOTE — Resourcing issues during a disaster include personnel, equipment, systems and finance. The authority for mobilizing and requisitioning resources should be clearly identified and documented.

* + 1. *Emergency Control Room (ECR)*

Once the emergency response team/cell is installed, a center or various centers should be established where the team/cell and key personnel can meet during emergency simulations, the warning period, and actual emergencies. Typically, regular office space shall be allocated for this function, but the emergency plan should specify at least one alternate site that can be used if the first is inoperable. The emergency control room should have the following characteristics:

* + - * 1. minimal vulnerability to the most common hazards in the area,
				2. quick access routes,
				3. reliable communication facilities, including telephones, fax, radio transmitter and receiver, television, and radios with commercial, civil band, and ham radio frequencies,
				4. coordination with the early warning system,
				5. list of officer including their name, post and contact number and role assigned in the emergency response team/cell,
				6. list of key personnel including name, post, department, phone number from external agencies such as police, fire, disaster management authority, ambulance, nearby hospitals and suppliers shall be displayed at notice boards.
				7. road Map leading to site
				8. back-up power system
				9. 24-hour security
1. detailed plans of all systems and copies of the emergency operation plan and of pertinent documentation
2. adequate equipment, site layout showing assembly points and escape route and firefighting equipment.
3. safe
4. registry of activities
5. name of the shift in charge on duty with telephone number

## **Competence**

The top management shall:

* 1. determine the necessary competence of person(s) doing work under its control that affects its disaster management system;
	2. ensure that these persons are competent on the basis of appropriate education, training, or experience;
	3. where applicable, take actions to acquire the necessary competence, and evaluate the effectiveness of the actions taken, and
	4. retain appropriate documented information as evidence of competence.

NOTE — Applicable actions may include, the provision of training to, the mentoring of, or the re- assignment of currently employed persons; or the hiring or contracting of competent persons.

## **Training**

* + 1. The top management shall assign a safety officer to provide suitable training to concerned officers and workers to ensure that:
1. the disasters and their impacts on drinking water supply system is understood;
2. the prevention and mitigation measures are familiarised.
	* 1. The safety officer shall ensure that:
		2. the training and the exercise program are consistent with the objective of disaster management system or applicable Indian regulations;
		3. every exercise has clearly defined objectives and result in a post-exercise report that contains recommendations. This report should be used to improve disaster management system, including the capability of the people involved in the exercise, in a timely manner;
		4. all types of training and exercises that is found suitable for the purpose of disaster management in the drinking water utility/supplier or specified in this standard is identified with their frequency;
		5. a training calendar is prepared;
		6. a training faculty either on regular or contractual basis is been appointed to implement the training schedule for all such trainings and exercises;
		7. orientation sessions and workshop for emergency response plan is been imparted to the officials and the staff;
		8. the outcome of the training and exercise program is set and documented.

## **Awareness**

The officer or staff doing work under the emergency response team/cell should be aware of:

* 1. the objectives of the disaster management system;
	2. their contribution to the effectiveness of the disaster management system, including the benefits of improved disaster performance, and
	3. the implications of not conforming with the disaster management system requirements.

## **Communication**

### *General*

The top management shall determine the need for internal and external communications relevant to the disaster management system including:

1. if necessary, who is authorized to perform the communication,
2. on what it will communicate,
3. when to communicate,
4. with whom to communicate, and
5. how to communicate.

### *Disaster management system communications — Internal*

The top management shall identify and communicate to all those within the drinking water utility/supplier who have a role in initiating and implementing the emergency response plan. The drinking water utility/supplier shall communicate:

* 1. The role they are identify for
	2. the process and procedures they are required to follow,
	3. the training and exercising that they are intended to perform in the execution of the plan, and
	4. any change to the disaster management system that is pertinent to their role.

NOTE — The top management shall determine the frequency of such communications in order to ensure that its state of preparedness is maintained.

### *Disaster management system communications — External*

The top management shall assign a liaison officer (LO) to ensure that

1. an arrangement with external organization involved in disaster management system is been set in order to receive prior communication. This will include the government authorities, other utilities providing the same or similar services, the media, users of the services, and the general public.
2. a variety of channels and techniques such as mass media (radio, television, newspapers), megaphone vans, religious services, social media or community message boards are present to disseminate which locations will have access to the drinking water utility/supplier services, on what days and at what time;
3. coordination with the officer from the local authority to issue statements to the press, so that the information provided is accurate, authorized and well-informed;
4. open communication with other concerned service provider that are indirectly associated such as road service, power utility etc., under such scenario;
5. there is an agreement on the role of the drinking water utility/supplier and the external organization for the types of incidents identified;
6. there is agreement on the co-ordination and inter-organization communication arrangements;
7. in case of disaster situation, details of the incident as per the incident report form referred in Annex C and other necessary information as identified by the top management is communicated to all the relevant external organizations.
8. relevant information from training exercises is exchanged in order to improve the emergency response plan, and
9. changes to the circumstances within the drinking water utility/supplier or an external organization, that could influence the operation of the disaster management plan, are identified and addressed.

NOTE — The drinking water utility/supplier should agree with all identified organization, the frequency method and format of such communications which should aim to ensure that the drinking water utility/supplier plans remain up to date.

## **Documented Information**

### *General*

The drinking water utility/supplier shall maintain the documented information required by this standard, and determined by the drinking water utility/supplier as being necessary for the effectiveness of the disaster management system. The information shall be documented to an extent that is accurate and complete but remains easy to understand. The documents, which may be either in electronic or paper format or both, should be stored in a safe, but accessible place, including off site locations, so that they can be retrieved quickly when the need arises. The documented information shall include:

* 1. all procedures for dealing with a disaster;
	2. nominations to the disaster management committee, collaboration agreements with external organizations;
	3. lists of equipment and their location, or any other special arrangements etc.;
	4. incident report form filled by safety officer (SO) and duly signed by Incident Commander (IC) as per Annex C.

NOTE – The extent of documented information for a disaster management system can differ from one drinking water utility/supplier to another due to the size and its type of activities, processes, products and services, the complexity of processes and their interactions, and the competence of persons.

### *Creating and updating*

* + - 1. When creating and updating documented information the drinking water utility/supplier shall ensure:
	1. identification and description including a title, date, author, or reference number etc.;
	2. format and media,
	3. review and approval for suitability and adequacy.
		+ 1. All decisions should be recorded in writing; the reason for each decision should be documented.
			2. In the event of a disaster, the alerting of the disaster management committee as well as its work should be documented for later reference.
			3. Any change (internal or external) that impact the drinking water utility/supplier shall be reviewed in relation to its disaster management system. The review should also identify any new critical activities that need to be included in the disaster management system.

### *Control of documented information*

* + - 1. Documented information of external origin determined by the drinking water utility/supplier to be necessary for the planning and operation of the disaster management system should be identified as appropriate, and controlled.
			2. For the control of documented information, the drinking water utility/supplier shall address the following activities, as applicable:
1. distribution, access, retrieval and use;
2. storage and preservation, including preservation of legibility;
3. control of changes (version control);
4. retention and disposal.
	* + 1. The drinking water utility/supplier shall have at least one backup set of documented information stored offsite, but readily accessible.

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

1. **OPERATION**

## **Operational Planning and Control**

* + 1. The top management shall plan, implement and control the processes needed to meet requirements of this standards by
	1. establishing criteria for the processes,
	2. implementing control of the processes in accordance with the criteria, and
	3. documenting information to the extent necessary to have confidence that the processes have been carried out as planned.
		1. The top management shall ensure the control on;
	4. planned changes
	5. outsourced processes;
	6. key processes of external organizations.
		1. The drinking water utility shall plan actions to take mitigation measures for any adverse effects, as necessary.

## **Requirements for Disaster Management System**

* + 1. *General*

The drinking water utility/supplier shall maintain its disaster management system in order to:

* 1. maintain operational efficiency;
	2. providing alternate water supply of water in case of disruption in regular piped water supply service beyond 36 hours.
	3. meet customer satisfaction;
		1. *Pre-disaster plan*

The drinking water utility/supplier shall consider the following steps in its pre-disaster plan:

1. identification of the disaster events to which their specific utility is vulnerable and assess both the likelihood and potential impacts on basic infrastructure and on drinking water supply system;
2. after carrying out the vulnerability assessment, the next step is to identify the most effective prevention and mitigation measures based on the vulnerability analysis;
3. preparation of guideline for protection of civil structures and electromechanical equipment.
4. determine the number of people would be affected in case of disaster and the capacity of drinking water utility/supplier required to respond in the emergency situation for supply of drinking water;
5. the potable water alternatives that are the most feasible, like bulk water supply by the neighboring water utilities through tankers or pipelines, bottled water supply, locally produced water etc.;
6. resources needed from others, including regional, state or central government agencies for supply of drinking water;
7. process for communicating the resource requests to the various emergency service agencies;
8. identification of priority supply points and forecasting their demand;
9. awareness-raising campaigns on water and sanitation management and health outcomes should be addressed before the crisis happens;
10. during public health emergencies the spokesperson’s image and voice should be familiar to audiences to invite trust. He/she should be trained in how to build up and deliver the messages and should be informed about water and sanitation utilities and public health threats;
11. training for the identified team should be focused on how to develop timely and effective communication skills to inform the public, partners, and stakeholders about recommendations;
12. along with increasing awareness and training, the attitude change of the general public should be promoted.
	* 1. *Onset disaster plan*

There shall be a proper operating procedure for mobilizing community participation during each stage of the disaster management. The concerned personal shall be familiar with the same and shall be able to take appropriate measures to ensure that the community participates substantially. While preparing the onset disaster plan the drinking water utility/supplier shall consider:

* 1. provision for accurate, timely, unique, frank and comprehensive announcement of the disaster situation;
	2. provision for the precise and prompt situation ascertainment that shall consider ascertainment of combinations of following types of damage:
1. contamination of the water source and damage of the raw-water intake;
2. damage to the water-treatment works, including structural damage, mechanical damage, loss of power supply, contamination due to flooding etc.;
3. damage to pumping stations;
4. pressure failure in all or part of a water distribution network, allowing backflow;
5. damage to both sewerage and water mains in the same locality, with local seepage into water pipes where the pressure is reduced;
6. badly repaired plumbing in domestic or public buildings, resulting in back siphonage;
7. failure to disinfect a contaminated source correctly, or to maintain an adequate chlorine residual throughout the system.
8. the current availability of supplies from all sources, the causes of supply problems such as dry streams and wells, pipe breaks, dams empty, tanks damaged or silted up, roof catchments destroyed, etc., and alternative sources and their status;
9. the causes or indicators of contamination such as human or animal bodies in the water, discoloration of the water, high turbidity, unusual smell, saltiness, diarrhea or other possible water-related illnesses in the population.
	1. provision for, relief, and aid to the victims;
	2. provision of alternate water supply for survival and rehabilitation of the affected people by managing with the available resources, till proper drinking water facilities become operational;
	3. provision for deactivation of the special task force shall be declared, and upon deactivation, the operation shifts to the post-disaster phase of evaluation and review followed by consideration of continuous improvement actions.
		1. *Post-disaster plan*

The drinking water utility/supplier shall prepare post-disaster plan considering rehabilitation and reconstruction measures to restore the drinking water supply service to the normal situation. While preparing post-disaster plan the drinking water utility/supplier shall consider the following:

* + - * 1. provision to start the restoration of the drinking water supply services as earliest possible;
				2. priority recovery points shall be established based on clear criteria for determining the order of priorities;
				3. provision of separate situation assessment shall be incorporated, in order to evaluate the situation during the recovery stage;
				4. criteria for the deployment of the measures for recovery shall be known;
				5. implementation of the recovery plan such as repairing the damage, verification, restoring the service shall be incorporated;
				6. criteria for assessments during recovery stage shall be known;
		1. *Alternate water supply*

The drinking water utility/supplier shall ensure that:

* 1. The target levels of minimum per capita drinking water supply of 2 liters for first 3 days, subsequently 4.5 liters for next 7 days and 7 liters for 21 days from the date of announcement of disaster by concerned person;
	2. OR
	3. The target level of per capita water supply for the survival shall be as per table 1 (WHO)

|  |  |  |
| --- | --- | --- |
| Type of need | Quantity (lpd) | Comments |
| Drinking and food | 2.5 to 3 | Depends on climate and individual physiology |
| Basic hygiene practices | 2 to 6 | Depends on social and cultural norms |
| Basic cooking need | 3 to 6 | Depends on food type, social and cultural norms |
| Health centers and hospitals | 40 to 60 liters/patient | Additional quantities may be needed for laundry equipment, flushing toilets, etc. |

* 1. Immediately after restoration, drinking water utility/supplier shall make efforts to provide safe and equitable access to a sufficient quantity of water for drinking, cooking, personal, domestic hygiene and other chores to all the people.
1. **SAFETY AUDIT**
	1. **Objectives of Safety Audit**

The top management shall consider the following aspects to develop the objectives of the safety audit:

* 1. To review the process, plants and equipment to recognize the hazards for statutory, moral and economic angles towards safety and health of the workers and community around the plant.
	2. To evaluate the effectiveness of present safety, health and environment protection measures being practiced in the plant.
	3. To evaluate the existing efforts of the drinking water utility/supplier in the direction of disaster control and preparedness to meet the likely emergencies.
	4. To recommend the control measures in order to improve the safety and health conditions and to
	5. prevent losses and accidents in the drinking water supply system.
	6. **Methodology and Technique for Safety Audit**

The top management shall ensure that the following methodology and techniques is being applied in the drinking water utility/supplier during safety audit:

* 1. Overview on safety shall be taken scientifically, evaluating the level of safety practice under several parameters using standardized evaluation from IS/ISO 45001.
	2. The drinking water utility/supplier shall forward a copy of the auditor's report along with his comments to the disaster management committee within 30 days after completion of such audit.
	3. Periodically safety visit at plant/installation should be done by disaster management committee as and when required.
	4. Safety register should be signed by safety officer assigned by disaster management committee.
	5. Any delay in restoration should be brought under the notice of disaster management committee.

# IMPROVEMENT

## **Nonconformity and Corrective Action**

When a nonconformity occurs, the drinking water utility/supplier shall react to the nonconformity, and take necessary actions to control and correct it. The drinking water utility/supplier shall evaluate the need for action to eliminate the causes of the nonconformity, in order that it does not recur or occur elsewhere,

* 1. by reviewing the nonconformity,
	2. determining the causes of the nonconformity, and
	3. determining if similar nonconformities exist, or could potentially occur,
	4. implement any action needed,
	5. review the effectiveness of any corrective action taken, and
	6. make changes to the disaster management system, if necessary.

The drinking water utility/supplier shall document information as evidence of the nature of the nonconformities and any subsequent actions taken, and the results of any corrective action. The drinking water utility/supplier shall establish, implement and maintain procedures for dealing with actual and potential shortfalls in the disaster management system and for taking improvement and corrective actions. The procedures should define criteria for the following:

* 1. identifying the shortfalls of the disaster management system and taking actions to mitigate their impact and avoid their recurrence;
	2. evaluating the need for actions to improve the disaster management plan’s shortfalls and implementing
	3. appropriate actions designed to avoid their occurrence to a specified timeline;
	4. recording the results of corrective actions and improvement actions taken;
	5. reviewing the effectiveness of the corrective and improvement actions taken.

Actions taken should be appropriate to the magnitude of the problems and the risk and their potential impacts. The drinking water utility/supplier shall ensure that any necessary changes are made to disaster management system documentation within a specified timeline.

## **Continual improvement**

The drinking water utility/supplier should continually improve the suitability, adequacy and effectiveness of the disaster management system. The outputs from management reviews should include any decisions and actions related to possible changes to the disaster management policy, objectives, targets and other elements of the disaster management system, consistent with the commitment to continual improvement.

# Annex A

(Informative)

*(Clause 4.5.1)*

**Process flow of disaster management system**

A schematic diagram of process flow of disaster management system is given in figure 1. The components of disaster management systems are as following:

**A.1 Preparedness structural organization**

The drinking water utility/supplier shall be a structural organization where work and procedures are preassigned.

**A.2 Activating the disaster management committee**

The procedures for convening the disaster management committee should be defined and agreed in advance at the planning stage. The top management shall check the availability of all the members of the disaster management committee, ensure immediate replacement of any non-available member deemed essential, determine appropriate representation within.

Activation of the disaster management committee includes:

* 1. Activate links with other agencies: The relevant organizational representatives should establish links to appropriate external disaster management committee as required,
	2. Activate cooperation channels with other organizations,
	3. Activate communication channels,
	4. Ensure the availability of the necessary resources needed according to the disaster management plan,
	5. Seek the validation by the relevant authority of the state of the disaster, and verify that the authorities’ ability to act and commit resources is current.

**A.3 Situation ascertainment**

An ascertainment of unmet needs is usually carried out to identify the affected areas in the drinking water supply system, population affected by insufficient or contaminated water supplies, the quantity of water needed for various purposes etc.

**A.4 Situation assessment**

The assessment of the situation results from the analyses, interpretation and integration of the findings of the situation ascertainment. The drinking water utility/supplier should conduct a separate situation assessment, in order to evaluate the situation during the recovery stage.

**A.5 Decision making**

The disaster management committee should make decisions based on the resources and information available, taking into account the requirements of the relevant organization representatives. All decisions should become documented information.

**A.6 Implementation of decisions and issuing of orders**

The disaster management committee should issue the necessary orders on the basis of the decisions taken.

**A.7 Supervision and operational control**

The disaster management committee should supervise and control the execution of orders to ensure that orders are carried out properly.

**A.8 Communications and cooperation**

The disaster management committee should ensure that the communications plans are implemented to ensure effective communications

1. within the disaster management committee,
2. with customers and the general public,
3. with external stakeholders,
4. with other organizations included in the disaster management plan, and
5. within the organization.

The disaster management committee should also ensure that the protocols agreed with the relevant authorities are enacted.



Figure 1 — Schematic work flow of a Disaster Management System

# Annex B

**(Informative)**

(*Clause 6.2.1*)

**Components of the water supply system in the city which may be affected by the disaster**

|  |  |
| --- | --- |
| **Drinking water system unit** | **Most likely impacts** |
| Raw Water storage | Cracks in dams, dry storage during draught, deposition of silt, accumulation of debris and damage of machines and equipment due to flooding of water |
| Raw water conveyance system | Breach of embankments of canals, dislocation of joints, washing away of pipes and deposition of silt etc. |
| Water Treatment facilities | Excess turbidity, contaminants, inundation of equipment, pumps and damage due to seismic pressure. |
| Primary filter water storages | Infiltration/ exfiltration due to cracks, mixing of contaminants. |
| Rising mains/ pressure mains | Dislocation of joints, washing away of pipes and vandalism. |
| Regional water storages/ secondary storages | Infiltration/ exfiltration due to cracks, mixing of contaminants. |
| Tertiary of colony level storage reservoirs | Infiltration/ exfiltration due to cracks, mixing of contaminants. |
| Water Distribution system | dislocation of joints and mixing of contaminants |

All the above components of the water supply system are affected differently by the natural or manmade disasters. Accordingly, the mitigation measures are different for the different components.

# Annex C

*(Clause 7.5.3)*

**Incident Briefing Form (NDMA)**

|  |
| --- |
| **1. Incident Type** |
| 1. **Site layout and affected areas with date and time of preparation**
 |
| 1. **Summary of current actions**

**Action already taken****Actions to be taken****Difficulty in any in response including mobilization of resources and manpower** |
| 1. **Resource summary**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Resource type** | **Quantity** | **Expected time of arrival** | **Site of deployment** | **Assignments** |
|  |  |  |  |  |
|  |  |  |  |  |

 |
| 1. **Status of Infrastructure**

|  |  |  |  |
| --- | --- | --- | --- |
| **Type of Unit** | **Unit ID** | **Partially damaged** | **Completely damaged** |
|  |  |  |  |
|  |  |  |  |

 |
| 1. **Threats, if any which may be increase severity of incident**
 |
| 1. **List of task assigned with name of concerned officer**
 |
| 1. **If applicable, quantity of alternate water supplied per capita with mode of supply**
 |
| **Prepared by (Name and Post)**  |