



**International
Standard**

ISO 24595

**Drinking water, wastewater and
stormwater systems and services —
Guidelines for the provision of
alternative water service for
essential facilities during a crisis**

*Systèmes et services relatifs à l'eau potable, à l'assainissement
et à la gestion des eaux pluviales — Lignes directrices pour la
mise en place d'un service d'eau alternatif pour les installations
essentiels en cas de crise*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 224, *Drinking water, wastewater and stormwater systems and services*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Water is fundamental to life and its distribution is an essential service. Water supply systems are designed to be reliable, but they can be subject to disruption from internal or external factors, including operational error, lack of rehabilitation, non-intentional physical damage, malicious acts (e.g. vandalism, criminality or terrorism), natural disasters (e.g. earthquakes, floods, hurricanes or volcanic eruptions) and source water disruptions caused by environmental factors or human activity.

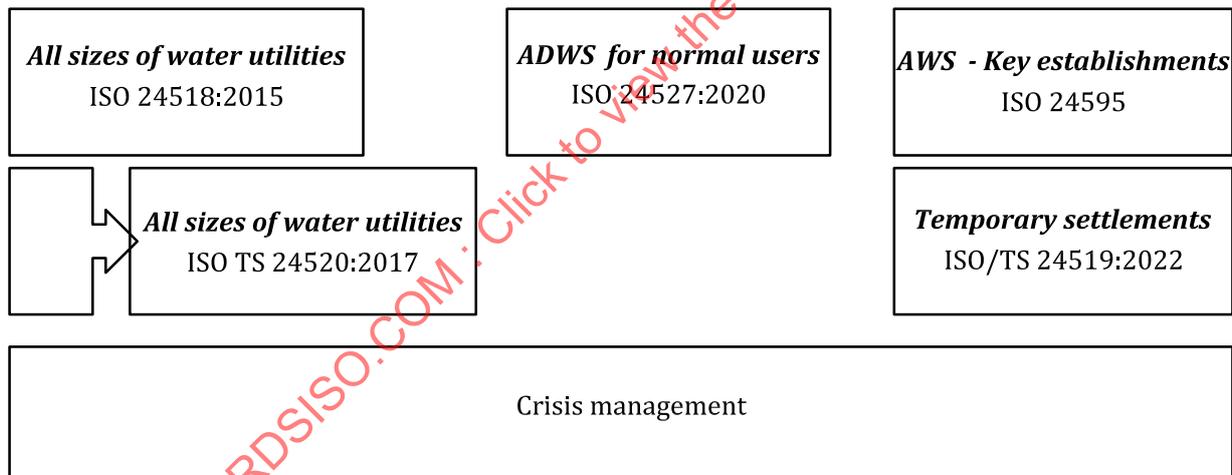
This document is intended for water utilities that normally provide a service without interruption through a water distribution network. It provides guidelines for the effective implementation of alternative water service (AWS) provision during extended periods of disruption or interruption of the water supply.

In many cases, operational and organizational processes will exist within water utilities to deal with short periods of localized interruption to water distribution. However, if the service interruption exceeds the duration or extent of anticipated events, an interruption can escalate into a crisis at local, regional or, exceptionally, national level.

NOTE 1 For adequacy and consistency, the guidance in this document typically assumes an operational response at a crisis level. However, it is applicable for all levels of operational incidents requiring AWS deployment, including normal business continuity preparedness and response.

NOTE 2 For guidance on the management of crises, see ISO 24518^[1] and ISO/TS 24520.^[2] For guidance on AWS distribution, see ISO 24527.^[3]

This document does not concern the cases already covered by ISO 24518,^[1] ISO/TS 24520^[2] and ISO 24527.^[3] [Figure 1](#) shows the articulation between these three documents and this document, in order to show their complementarity.



NOTE 1 ISO 24527:2020^[3] is not applicable to:

- key establishments and facilities (e.g. hospitals, homes for the aged, schools, reception facilities and vital plants);
- water supplied for industrial, agricultural or commercial purposes;
- temporary settlements.

NOTE 2 In many countries, AWS for essential facilities, as described in this document, are regulated.

Figure 1 — Standards dedicated to crisis management

A significant water interruption (arising from quantity and/or quality issues) can impact public and personal health and well-being, and economic performance. A prolonged interruption can progressively threaten the coherence of the supplied community.

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When such a water interruption affects essential facilities, the impact is even more significant and can cause crucial economic and negative social effects.

Therefore, it is important to plan in advance in order to diminish the negative effects of such a crisis situation on the community.

The roles of relevant authorities, responsible bodies, water utilities and operators can differ between and within countries and result in different minimum requirements for AWS provision. Nevertheless, it is generally recommended that such organizations recognize the importance of uninterrupted water production and distribution, even at times of crisis experienced by the water utility, for the well-being of the supplied community.

Water utilities are encouraged to reduce the risk of water supply interruption. This is typically achieved by a combination of good planning, design, procurement, installation, operation and maintenance of the water assets. Such measures should include the provision of an AWS for essential facilities and users during a crisis.

It is also recommended that the water utility's capability to provide an AWS be consistent with the maximum likely service interruption (extent and duration) identified through risk assessment. The provision of an AWS for essential facilities necessitates thorough preparation (e.g. to address planning, procurement, logistics, control and communication), as well as awareness of the need and commitment at all levels of the organization to be effective and efficient.

AWS during a crisis can be provided using one of the three following actions, as appropriate:

- a) arranging for an alternative source of water;
- b) using the water distribution network in a non-conventional manner;
- c) not using the water distribution network.

AWS planning and provision can include guidelines by responsible bodies on monitoring and control methods. This document covers water quality issues only to the extent that they relate to water provided via an AWS.

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Drinking water, wastewater and stormwater systems and services — Guidelines for the provision of alternative water service for essential facilities during a crisis

1 Scope

This document provides guidelines for alternative water service (AWS) provision during a crisis for the ongoing operation of essential facilities.

This document addresses:

- AWS principles and methods;
- AWS operational planning and implementation.

This document is not applicable to:

- planned water supply interruptions forming part of the drinking water utility's normal operations;
NOTE However, many of the principles and methods described can be appropriate in such circumstances.
- water supplied to temporary settlements, such as refugee camps;
- the development and implementation of a crisis management system for water service, which is covered by ISO 24518^[1] and ISO/TS 24520,^[2] or the development and implementation of AWS provision during a crisis for private users, which is covered by ISO 24527.^[3]

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 24513, *Service activities relating to drinking water supply, wastewater and stormwater systems — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 24513 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 alternative water service AWS

water provided to users by means other than through the normal drinking water system

Note 1 to entry: AWS can be required due to the loss of supply or due to the fact that the water is unfit for the intended use.

3.2

containerized water

packaged water

water deployed in containers for alternative drinking water service provision

EXAMPLE 1 Bottled or canned water, pre-prepared and hygienically sealed, with a predetermined shelf-life.

EXAMPLE 2 A personal water bag, pre-prepared but empty, and filled during an incident.

EXAMPLE 3 Static water tanks; towed bowsers; mobile water tankers, disinfected and deployed, and filled during an incident.

3.3

drinking water allocation

daily per-capita water quota to be supplied to users during *alternative water service* (3.1) provision

Note 1 to entry: The relevant authority, the responsible body or the drinking water utility (in the absence of guidance from the relevant authority or responsible body) can determine drinking water allocation(s) for categories of users.

Note 2 to entry: Drinking water allocations can differ between categories of user and can exclude some categories of users.

Note 3 to entry: The size of drinking water allocations can be varied at different times during the crisis.

EXAMPLE Per-capita domestic user in first 12 h of crisis response; per-capita per-day domestic user after first 12 h; per-capita per-day special needs user.

[SOURCE: ISO 24527:2020, 3.5.]

3.4

essential facility

entity whose service or role is considered essential for the proper functioning of the community and would be seriously disrupted by the interruption of the water service

Note 1 to entry: This decision is in the hands of the civil and/or military authorities.

EXAMPLE Hospitals, homes for the aged, schools, prisons, military establishments, essential industrial, agricultural or commercial establishments, livestock facilities.

Note 2 to entry: The definition focuses on disruption to the "proper functioning of the community". Farms are generally outside the community, but livestock handling and retention facilities can be; for example, abattoirs are normally within an urban area.

4 Principles for AWS provision for essential facilities during a crisis

4.1 General

During a crisis involving an interruption to water distribution, the water utility should ensure that an AWS is provided to users and essential facilities.

The needs for AWS provision to essential facilities should be a high priority.

Combined efforts of the essential facility, water utility and other relevant or responsible authorities during preplanning, planning and AWS implementation are necessary.

The water utility should involve the essential facilities during the preparedness phase in order to advise them to plan the necessary arrangements, such as water treatment units, equipment and point of distribution (POD).

Water allocation to keep essential facilities running is significantly higher than the allocation of drinking water for normal users (as discussed in ISO 24527^[3]). It should be determined jointly by the water utility and the essential facilities under supervision of the relevant authorities and/or responsible bodies.

The required water quality for AWS provision is determined jointly by the relevant authorities, the essential facilities and/or responsible bodies.

The water quality to be supplied should be tested in order to ensure compliance with the requirements. If the required water quality is not available, it is recommended that the feasibility of using mobile water-treatment units is considered in order to bring the water to the required quality.

Non-drinking water may be used in the essential facilities' processes that do not require drinking water quality.

Communication, information and training are key elements for AWS.

4.2 AWS approaches

4.2.1 General

The water utility may adopt one or a combination of the AWS approaches described in [4.2.4.2](#) and [4.2.4.3](#); see also [Annex B](#) and [Annex D](#).

4.2.2 Alternative source of water

4.2.2.1 General

A primary response to providing AWS is to ensure that the water utility has alternative sources of water available to it for use in an emergency.

Examples of alternative sources of water can include available but currently unused groundwater extraction facilities, supplementary deeper extraction pipes in surface water resources, major stocked storage reservoirs of unused or treated water resources and arrangements with neighbouring water utilities to transfer water as needed to the utility facing a crisis.

4.2.2.2 Providing emergency water storage above ground or underground

Once the amount of water needed for the essential facility during crisis is determined, the construction of the appropriate storage facilities for the calculated volume of water should be planned and implemented.

4.2.2.3 Using alternative water sources (drinking and non-drinking quality)

The use of alternative water sources should be implemented when and if it is technically possible to connect different water source(s) to the essential facility, either directly from the source to the facility without passing through the water utility's network or by using the regular water utility's network.

Such a solution may be applied exclusively, if the alternative source is of drinking water quality, or as a partial solution, if the alternative water source is non-drinking water but can be used for part or all of the required processes for sanitary purposes, e.g. toilet flushing.

For guidance on the management of crises, see ISO 24518^[1] and ISO/TS 24520.^[2]

4.2.2.4 Connecting the water utility's network to an alternative water supply network

In some cases, with a relatively small effort the water utility or relevant facility can be connected by emergency or temporary connections to a nearby water supply network that was not affected by the crisis situation (e.g. bypassing damaged network areas of the regular supply system via mobile transmission lines).

Such a solution may be applied exclusively, if the alternative source has the capacity to supply the entire demand and is of drinking water quality, or as a partial solution, if the alternative water source does not have the capacity to supply the entire demand or is non-drinking water but can be used for part or all of the required processes for sanitary purposes, e.g. toilet flushing.

4.2.3 Using the drinking water distribution network in a non-conventional manner

This approach involves the drinking water utility supplying drinking water to essential facilities via the drinking water distribution network but using different means than the regular operational methods.

Proven methods of AWS provision using the distribution network in a non-conventional manner are described in [7.2](#).

4.2.4 Not using the water distribution network

4.2.4.1 General

This approach requires the preparation of resources (equipment and means) necessary for supplying AWS under crisis conditions for each specific essential facility.

The different possibilities for implementing this approach are described in [4.2.4.2](#) and [4.2.4.3](#); see also [Annex B](#) and [Annex D](#).

4.2.4.2 Using tankers

Tankers may be used as a non-continuous alternative water source. The tanker should be connected to a storage tank serving the facility.

Such a solution may be applied exclusively, if the alternative source is of drinking water quality, or as a partial solution, if the alternative water source is non-drinking water but can be used for part or all of the required processes for sanitary purposes, e.g. toilet flushing.

4.2.4.3 Using water treatment units

When the water crisis is caused by contamination in the water supply network to a degree that the water does not comply with applicable requirements, water treatment units may be used. For this, the facility should have prepared beforehand the necessary water treatment means and equipment to bring the water to the required quality and operate and maintain the units during the crisis, such as personnel and chemicals.

Frequently, the implementation of a combination of more than one of the solutions described in [7.2.1](#) to [7.2.5](#) will be necessary, for example static reservoirs or tanks filled by mobile tankers during a crisis. Proven methods of AWS provision not using the drinking water distribution network are described in [7.3](#).

5 Understanding the operation context from an AWS perspective

5.1 General

In order to determine its AWS provision for essential facilities, a water utility should first have a clear understanding of its normal operation during normal (non-crisis) circumstances.

The water utility should determine:

- a) which services and facilities are defined as essential facilities;
- b) what are the water quantities that have to be allotted and secured to each essential facility.

5.2 Determining the essential facilities

The water utility is not entitled to determine which user services, establishments and farms are considered essential facilities for the continuity of the proper functioning of the community served by the water utility.

This decision is in the hands of the civil and/or military authorities.

The water utility should approach the relevant authorities and get the list of the facilities that are considered essential for the proper functioning of the community.

6 Planning for AWS provision to essential facilities

6.1 General

AWS provision, including to essential facilities, should be an integral part of the water utility's wider crisis management response.

During normal operation, and based on a risk assessment, the water utility should identify the disruption scenarios that can lead to the need for AWS provision to essential facilities which cannot be managed by its normal organizational structures and operational means.

The water utility should take into consideration that more than one approach and solution can be used during a crisis. Jointly with each one of the essential facilities, it should decide upon the preferred approaches and solutions for AWS provision, according to the considerations listed in [4.2](#).

The water utility should prepare engineering, operational and logistical plans to implement its chosen approach(es) to AWS provision. The selected solutions to AWS provision should be planned and exercised jointly with the essential facilities during normal operation, and responders should be appropriately trained in order to demonstrate their readiness when required.

The water utility should also ensure that assets which are intended to be used in contact with drinking water or for drinking purposes are approved by the relevant authority. Such assets can include cleaned and disinfected drinking water containers, tanks and water treatment units.

6.2 Risk assessment

The risk assessment for AWS should be integrated into the water utility's global risk management provisions. The water utility should reduce the risk of water supply interruption. This is typically achieved by a combination of good planning, design, procurement, installation, operation and maintenance of the water assets (see [Annex D](#)).

6.3 Pre-planning

6.3.1 Establishing disruption scenarios

6.3.1.1 Establishing the context of each essential facility within a service area

The water utility should identify:

- the relevant characteristics of the water system of individual service areas, such as alternative water sources; gravity fed or pumped areas; pressure zones; and water quality features or constraints;
- characteristics of the environment of individual service areas, such as rural or urban distinctions and topographical features that provide access or act as barriers (e.g. highways, rivers, railways);
- characteristics of the essential facilities in individual service areas;
- its available resources (including personnel).

6.3.1.2 Establishing individual disruption scenarios

Based on its risk assessment outputs and taking into consideration the characteristics of the service area, the water utility should identify the possible circumstances of the crisis, such as:

- the possible events to occur and their characteristics (e.g. the most likely, the most common or the most dangerous water quantity event or water quality event);

- the available information about similar events and related uncertainties;
- the expected extent of the damage feared;
- how the essential facility would be impacted;
- existing control measures.

6.3.2 Determining the water quantities that should be allocated to essential facilities

The water utility, jointly with the essential facilities, should establish water allocation(s) for each of the essential facilities, as described in [Clause 5](#), as a fundamental factor of AWS planning. The water allocation(s) are particularly significant for AWS solutions where the normal water distribution network is not used. The essential facility's water allocation directly determines the extent of resources (including personnel) needed for AWS operations (see [Annex C](#)).

The water quantities that should be allocated to essential facilities should be determined according to:

- a) the time that the water utility considers necessary for restoring the capability to supply water to the facility through the distribution system (even for a partial restoration that does not allow the supply of 100 % of the capacity, but allows the supply of the necessary water quantity to run the essential service);
- b) the quantity of water that is necessary for keeping the essential services running for the community.

This consideration should be given for each one of the facilities that were determined essential, jointly by the water utilities, authorities and the essential facilities.

See more information on water allocation calculation in [C.2](#).

6.3.3 Pre-planning in accordance with the disruption scenario

Based on each crisis scenario, the water utility, jointly with the essential facilities, should:

- a) decide on the type and quantity of AWS resources to be prepared and deployed (e.g. reservoirs, water tankers, treatment units) and the timescale for their provision;
- b) identify and coordinate AWS procurement within and outside the service area(s) affected;
- c) identify possible alternatives for water sourcing, conveyance, treatment and water distribution wherever it is needed;
- d) prepare logistical and engineering plans to implement the chosen approach(es) and solutions to provide the quantity and quality of AWS provision required;
- e) identify the responders necessary to conduct field operations during a crisis and provide adequate training and support to permit them to display readiness when required;
- f) consider quantities and storage capacity for firefighting purposes, if applicable.
- g) prepare communication means and procedures with other relevant authorities.

6.4 Securing resources and planning for their mobilization

Planning to construct, secure and mobilize resources for AWS provision should include the items listed in [6.3.3](#) and the following:

- a) Determining the area affected by the crisis within the service area(s): the water utility should determine the area(s) likely to be affected according to the individual circumstances of the crisis.

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- b) Additional considerations, such as variable weather conditions, the nature of the service area (e.g. rural, urban), topographical features (e.g. estuaries, rivers, valleys, hills), the presence of infrastructure (e.g. highways, railways, airfields, ports) and socio-economic considerations.
- c) Operational and engineering plans for supplying water: the water utility should organize its water system in a manner that permits as great a degree of flexibility and resilience as is deemed practicable and cost-effective (e.g. installing additional valves and interconnections beyond those essential for normal use, including connections to, for example, neighbouring water utilities and sources; installing foundations, power supplies and pipework to accept temporary pumping installations).

Such plans may include the distribution of non-drinking water, if such provision mitigates risks to public health or public safety (e.g. for processes that do not require the use of drinking water, for toilet flushing or firefighting purposes).

- d) Necessary arrangements should be made to mobilize, in due time, the water resources needed according to previously identified water allocations.
- e) The water utility should take into account the local legal or regulatory obligation for the essential facility's water allocation(s) as well as for water quality. Where the resource implications of addressing a worst-case disruption scenario put the ability to meet this obligation under strain, this should be escalated and discussed with the relevant authorities.
- f) The water utility should aim to balance the essential facilities' needs and expectations and the practicability of providing a reasonable water allocation for the period of the crisis duration.
- g) Alternative water resources: in cases where alternative water resources are proposed, the water utility, jointly with the essential facility owner or operator, should plan and coordinate these resources, considering options both within and outside the affected service area. Consideration should be given to:
 - 1) periods when an alternative water resource could be unavailable due to inadequate water quality and quantity (e.g. low source water level, algal bloom);
 - 2) possible alternative(s) for conveyance, treatment and water distribution by use of temporary waterworks (e.g. by utilizing portable treatment systems), which could make a normally unusable water resource viable;
 - 3) how a reservoir or a water tanker can be filled from an alternative water resource.
- h) AWS provision: the water utility should plan for adequate AWS provision by developing the following:
 - 1) A logistics plan for securing adequate supplies of water (see [Annex D](#)). Where this involves provision of alternative water sources, the plan should include pre-coordination with the alternative water operatives and suppliers. Such coordination could include contractual arrangements for the supply of agreed quantities. It could also include arrangements for minimum stock levels (held by the operator or supplier and/or the water utility) and the product's delivery to designated users or intermediate storage destinations. Such agreements should also specify time frames for implementation, including out-of-normal working hours arrangements.
 - 2) Pre-coordination with other service providers to facilitate:
 - securing alternative water supplies;
 - transportation of AWS resources to the essential facilities;
 - filling and replenishment of water to reservoirs and tankers;
 - collection and return of AWS resources from the essential facilities following recovery from the crisis.
 - 3) Keeping stakeholders informed of AWS provision, while addressing the differing needs of each type of essential facility.

- 4) Pre-coordination with other third parties, for example:
 - neighbouring and other water utilities (if mutual aid arrangements can be agreed);
 - military aid to the civil community (if such a protocol exists);
 - other stakeholders from whom understanding of, support to and/or agreement with the AWS arrangements are essential for maintaining public confidence.
- i) Internal and external communications: the water utility should develop a communications plan for internal and external communications during the deployment of an AWS, which should include:
 - 1) The identification of responsibilities for coordination during a crisis, including AWS provision, deployment and replenishment, and identification of any operational issues that could require escalation for tactical or strategic decisions. Those responsible for AWS provision should include updates about the effectiveness of those communications and the need to further tailor them to enhance interactions between the water utility and its stakeholders.
 - 2) Guidance on how relevant issues and decisions are managed and then communicated to achieve the desired outcomes.
 - 3) Crisis management decision processes (e.g. internal communications; user communications; stakeholder management) for framing and communicating relevant messages.
 - 4) Unrestricted cooperation and exchange through, for example, liaison persons.Guidance on AWS communication issues is provided in [Clause 8](#).
- j) Users with special needs: guidance on AWS provision for users with special needs is provided in [Clause 9](#). The water utility should plan AWS provision for users with special needs as follows:
 - 1) during normal operations, by preliminary identification of such special needs (e.g. essential facilities that need only drinking water for their essential services and processes);
 - 2) during a crisis, by liaising with both internal and external stakeholders to ensure that any dynamic supply adjustments to the requirements of users with special needs are captured and incorporated into the AWS response.
- k) Responders: the water utility, jointly with the essential facilities, should make the necessary personnel planning arrangements for AWS provision to be implemented. All relevant personnel should be trained periodically during normal operations. Training of any third parties anticipated to be involved in AWS provision should be undertaken, either at the request of the water utility or as other opportunities arise. Training should include practical exercises of all relevant personnel and third parties.

7 Implementation of AWS provision

7.1 General

The two approaches to AWS provision outlined in [4.2](#) include various accepted AWS implementation methods and solutions. A water utility's choice among these solutions is likely to be governed by its preferred approach, which should be determined during the planning stage (see [Clause 6](#)).

For each crisis, subject to these pre-existing constraints, the water utility should determine the decision process for establishing which solution(s) to use according to the:

- a) circumstances of the crisis;
- b) characteristics of the water system specific to the essential facility affected;
- c) characteristics of the environment specific to the essential facility(s);
- d) characteristics of the essential facilities;

e) available resources (including personnel).

More than one implementation solution method can be used during a crisis.

7.2 Non-conventional methods for water distribution network use

7.2.1 General

In this approach, water is supplied to essential facilities via the water distribution network, but not in the normal operational manner. Sometimes the service level can be of a lower standard than during normal service provision.

However, before running drinking water again in drinking water systems, the pipes should be flushed and residual chlorine should be checked when appropriate to confirm that it is within the required standards.

For some examples of assets for alternative water distribution, see [Annex A](#).

7.2.2 Construction and installation of water storage tanks

In this solution method, water storage tanks for the required capacity that has been calculated for the specific essential facility are built or installed in the user's premises or close to the user's premises.

These storage tanks receive their water from the water utility water distribution system and are connected directly to the essential facility's water distribution system.

These storage tanks may become an integral part of the essential facility's water distribution system and work all year around or they may be designed to store water only for crisis situations with the proper accessories to connect them to the system, to supply water to the designed services and processes deemed essential.

Adequate measures to ensure usability should be implemented, especially if these are for emergency purposes only, for example rinsing, disinfection or mixing.

7.2.3 Distribution of water by erection of standpipes

Where water quality is maintained but water quantity is constrained by the crisis, the water utility may operate AWS provision by erecting temporary standpipes connected to the water distribution network in order to fill mobile tankers, for example to feed fixed reservoirs. The temporary standpipes may also be connected directly by temporary connections to the essential facility's water system.

Such a solution method can create control issues with regards to the assets (e.g. the standpipes themselves and the hydrants on which they are mounted), the quantities of water discharged and the resulting flow disturbances in the water distribution network.

Deployment of this method depends on the water utilities' resources to manage the operation of the assets and can be affected by the degree of cooperation anticipated from essential facilities.

7.2.4 Recharging of isolated water distribution network assets by water tankers

According to circumstances and the event characteristics (e.g. treatment plant failure, aqueduct failure), the water utility can use mobile tankers to recharge water system storage assets, such as reservoirs, or the water distribution network itself (by pumped or gravity feed). This action can enable continued water supply to essential facilities through the water distribution network.

This solution method can require the approval of the relevant authorities, as it depends on sustained recharge of the water distribution network and carries an increased risk of contaminating the network.

7.2.5 Lowering the pressure at which water is supplied

Water should be supplied through the normal water distribution network, at a lower pressure than normal, by controlling valves and other water assets in accordance with circumstances and engineering constraints. This solution method can require the approval of the relevant authorities of a minimum sustained pressure in the water distribution network.

NOTE 1 Lowering the pressure in the distribution system reduces the loss of water through leakage and ensures greater availability for existing supplies.

NOTE 2 In order to use this method, it must be verified that it is acceptable to operate the existing water distribution system in such a manner.

7.3 Methods not using the water distribution network

7.3.1 General

In this approach, water is supplied to essential facilities via external water sources, using different kinds of equipment that can bring the water to the relevant facility.

This solution method should be implemented by trained personnel across the service area(s) affected by the crisis. The water utility should advise able-bodied users to independently approach an alternative water source operator. Users should be advised of alternative water source locations within close proximity of their residence or workplace or where they can legitimately claim a need. A water utility representative should be present to assist users.

7.3.2 Temporary point of distribution solution methods

7.3.2.1 General

One or more of the following solution methods can be used for distribution of water to essential facilities. See more information in [Annex B](#).

7.3.2.2 Static water tanks connected to the essential facility's water distribution system

Static water tanks can be connected to the relevant essential facility's inner water distribution system, either directly to the pipe lines or to the reservoirs or tanks from which the facility can draw water. Each static water tank should be replenished by a mobile tanker periodically (typically several times a day) with fresh water from an external resource configured for rapid refilling of mobile tankers. The efficiency of this method depends on the reliability of the replenishment cycles and minimization of AWS overuse by users.

When the hydraulic conditions demand it, a pressure pump should be installed to the tank water outflow in order to be able to supply the water to the essential facility water system at the adequate pressure.

In this solution method, the replenishment may be done by another mobile water tanker or by the rotation of full mobile tankers or towed bowsers for depleted ones. In this solution method, the water utility or the essential facility should strive to provide water continuously, unless interrupted briefly by the rotation of the mobile tankers or towed bowsers.

7.3.3 Via a fixed water resource

For this water distribution solution method, a fixed water resource such as a hydrant, reservoir, underground storage tank or well can be used where the quantity of water in the water resources is sufficient.

The water utility or essential facility (depending on the concerted decision between the water utility, the essential facility and the relevant authority as to the responsibility of the fixed point) should take the adequate measures to protect the resource, such as backflow prevention devices.

7.3.4 Via mobile water tankers or towed bowsers

For this solution method, water should be carried by mobile tankers or towed bowsers in cycles throughout the service area. Where practicable, the essential facilities should be able to receive water on a regular basis consistent with the cycle within close proximity of their residence or workplace or where they can legitimately claim a need. Users should be told the route being followed, approximate timings, stopping points (or arrangements to flag down the driver) and users' expected behaviours. The water utility may provide additional resources to supervise the discharge process where significant numbers of users are gathered.

In most cases, a storage tank in the service area is necessary to receive the transported water (see [7.3.2.2](#)). Also, a pump is often needed.

8 Internal and external communications

8.1 General

The water utility should consider informing the relevant stakeholders, in advance of any incident requiring AWS provision for essential facilities, about the requirements from each one of the relevant users, in order to allow for the planning and implementation of the users, and about any plans for AWS delivery. During a crisis with an AWS component, the water utility should use its chosen communications strategy and tools to convey information about the AWS implementation and deployment. The strategy should permit two-way communication with essential users and stakeholders, allowing AWS implementation and deployment to be amended as necessary to address relevant issues.

8.2 Preparing stakeholders in advance of a crisis involving AWS provision

8.2.1 Tailored messaging

The water utility should provide information to the relevant essential facilities on how the water utility will, and how the facilities are requested to, respond during an AWS event. Other stakeholders could require more specific advice, and possibly face-to-face briefings, to ensure that all expectations are discussed and outputs agreed.

8.2.2 Preparing essential facilities

Users' preparation requirements may be communicated through, for example, personal meetings between the water utility's representative and the relevant essential facilities' representatives, the water utility's website, social media, automated calling, texting or emailing, a periodic note attached to the water bill or public presentations to community bodies.

Communications should include information about the following:

- a) self-help and self-control in the management of the supply of alternative water solutions to the essential facility;
- b) drinking and non-drinking water storage and safe retention periods;
- c) AWS deployment methods and interactions with the essential facilities' relevant personnel;
- d) specific information regarding water use, should a non-drinking water AWS be used.

8.2.3 Preparing key stakeholders

Depending on the relationship with each key stakeholder, more sensitive information regarding preparation requirements may be communicated, including the maximum credible event the water utility plans to be capable of responding to while satisfying the required criteria.

Key assumptions, constraints or limitations affecting such a response should be shared with essential facilities and key stakeholders subject to their relevance and appropriate security requirements.

8.3 Alternative drinking and non-drinking water service information during a crisis

8.3.1 General

A key aspect of communications on AWS provision is the need to reassure stakeholders that the water utility remains in control of its planned water distribution activities in response to the crisis. Such reassurance should help to mitigate stress for users.

Guidance on communications issued by the water utility during a crisis is provided in ISO 24518.^[1]

8.3.2 How to communicate

8.3.2.1 Tailored communications

The water utility should provide information to essential facilities on the crisis, what is being done to deploy an AWS and the essential facility's role during the deployment of the AWS.

Other stakeholders may require more specific, direct and individual briefings.

The water utility should determine, jointly with each essential facility or stakeholder or their representative(s), the most appropriate means of these stakeholder communications.

8.3.2.2 Communicating with essential facilities

Given the dynamic nature of an AWS response, dynamic communication methods should be employed in addition to more traditional methods.

Dynamic communication methods can include:

- a) the water utility's website;
- b) automated texting and/or email;
- c) websites of external stakeholders (using links to the relevant pages of the water utility's website to maintain the current status of information);
- d) media outlets (radio, television, newspapers, websites and other internet portals);
- e) social media;
- f) the water utility's relevant call centre(s) (using temporary staffing or recorded messaging where necessary to manage increased call volumes and resourcing constraints).

Traditional communication methods can include:

- 1) printed warning notices;
- 2) newspapers (reports and paid advertisements);
- 3) billboards;
- 4) portable electronic messaging signs.

Rules and regulations dealing with privacy policy should be taken into account.

8.3.2.3 Communicating with other stakeholders

Given the dynamic nature of an AWS response, communication should also be offered to relevant stakeholders depending on their preferences. If possible, this communication should be as direct as possible, supplement existing communication methods and be consistent with the information supplied to all essential facilities.

Such communication methods can include:

- a) phone communications (at predetermined intervals or ad hoc);
- b) email updates;
- c) text messages;
- d) faxed reports;
- e) water utility representation within local, regional or national contingency bodies or committees;
- f) regular face-to-face reporting.

8.3.2.4 Communication with incident command system organization.,

In the case of disasters or crises, there should always be constant communication with the emergency response disaster control centre, i.e. the leadership in coping with the crisis. The utilities and the emergency response have different needs, requirements and coping capabilities. A joint strategy is essential for situation management, so that no contradictory measures are taken and the success of the operation is thus jeopardized.

This should be done during preparations as well as during the event. A large round table with representation from the different bodies (e.g. hospitals, key facilities, health authorities and emergency response authority) is essential for the planning of emergency preparedness measures and for the measures necessary to cope with the crisis situation. Communication tools and techniques

Useful communication tools and techniques can include:

- a) pre-prepared AWS script templates for completion during an event;
- b) frequently asked questions (FAQs) and answer sheets dealing with common issues and concerns associated with AWS events;
- c) customer response scripts for all relevant water utility personnel;
- d) briefing notes for personnel who may be approached directly by users for the latest information;
- e) regular updates for all water utility personnel and third-party support teams to assist them in answering queries.

8.3.3 What to communicate

8.3.3.1 Information to essential facilities

Information distributed to essential facilities during a crisis should be consistent and include:

- a) the current situation, its causes and consequences (where available);
- b) the current forecast of the service interruption's duration (where available);
- c) the nature of the AWS response in general and for specific users;
- d) reassurance that the situation remains under control;
- e) guidance and advice on appropriate and inappropriate behaviours by users;

- f) details of the AWS deployment (or where to find such details);
- g) reassurance on the preservation of water quality and self-help steps to aid its preservation;
- h) where to find further information and the nature of further updates.

The water utility should always maintain the highest integrity in communicating with essential facilities and other stakeholders and never knowingly provide false or misleading comments on progress towards restoration of service.

8.3.3.2 Information to other stakeholders

Supplementary information distributed to other stakeholders during a crisis can include:

- a) reports to responsible bodies (mandatory and voluntary);
- b) further details of the water utility's crisis management response;
- c) implications for individual stakeholders;
- d) constraints, risks and opportunities arising from the crisis;
- e) requests for support from individual stakeholders;
- f) proposed communication arrangements, information sources and update frequencies.

9 AWS provision in general and for users with special needs

During a water crisis affecting essential facilities, there will generally also be a need to provide drinking water for users with special needs, such as persons with compromised immune systems.

The water utility should preferably try to find an alternative water source that is of drinking water quality or provide for water treatment units that are necessary to ensure the alternative water source complies with drinking water requirements in relation to users with special needs.

See [Annex B](#) and [Annex D](#).

Guidance on alternative drinking water supply by the water utility during a crisis is provided in ISO 24527.
[\[3\]](#)

Annex A (informative)

Examples of assets for alternative water distribution

A.1 Water tanks in use

A.1.1 Static tanks

Static tank(s) can be of several types. The type and extent of the static tanks deployed at the essential facility should be determined according to the considerations provided in [Clause 5](#). Personal water tanks may also be static tanks.

Examples of static tanks are described and illustrated in [Annex B](#).

A.1.2 Mobile tanker

A mobile tanker can be used for replenishment cycles and/or as a water resource to the water system of the essential facility. Preferably, the mobile tanker should include a pump to deliver water to other water storage assets. Examples are described in [B.3.2](#) and illustrated in [Figure B.7](#).

A.2 Fixed water resource

A fixed water resource, such as a hydrant, reservoir or well, can be used as a water resource for the essential facility's water system by connecting the fixed water resource to the facility's water system.

There could be a need to provide the fixed water resource with a pump and temporary connections to enable the transmission of the water to the essential facility's water system.

Annex B (informative)

Large capacity containerized water

B.1 General

The following examples of containerized water can be used in a crisis for the provision of water to essential facilities:

- a) static water tanks;
- b) mobile tankers.

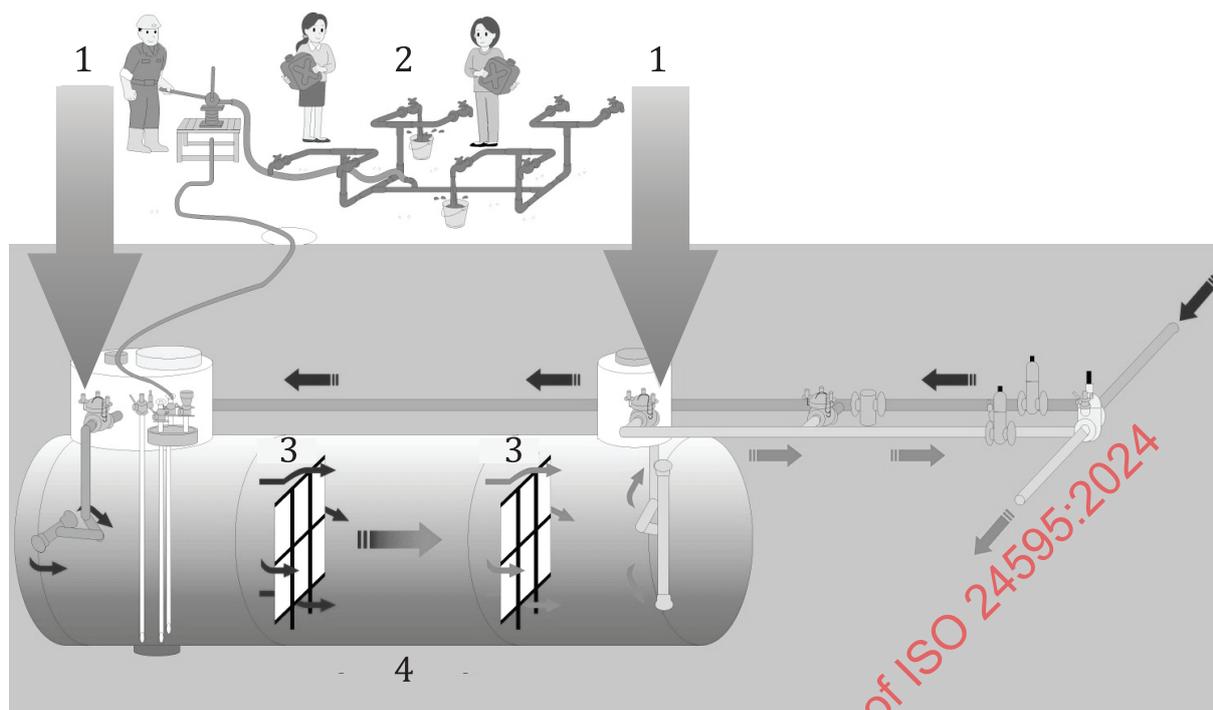
B.2 Examples of static water tanks

B.2.1 Underground storage tank

B.2.1.1 General

Emergency stop valves of an underground storage tank can be designed to shut automatically when an event occurs. Thus, the underground storage tank can work as both a small water service reservoir for the user and as a wide-bore pipe in normal conditions. Baffle plates can be installed, causing turbulent flow to avoid the occurrence of stagnant water. For AWS provision, water can be obtained from the underground storage tank by powered pumps or, if necessary, by manual pumping, see [Figure B.1](#).

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Key

- 1 emergency stop valve
- 2 taps
- 3 baffle
- 4 underground storage tank

- inflow
- outflow

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Figure B.1 — Underground storage tank flexible tank - type 1

The following issues should be considered during planning:

- Emergency operations: it is necessary to discuss and decide among stakeholders who can use the water and how much drinking water should be distributed to each person.
- Normal operations: it is necessary to discuss and decide among stakeholders who will bear the installation and maintenance costs and who will perform inspections and repairs.

B.2.1.2 General

Flexible tanks consist of an exterior cover and a filling bag.

All the accessories to the flexible tank should be operated considering water quality issues (e.g. not leaving temporary pipelines in the earth or touching areas that could be contaminated).

B.2.1.3 Flexible tank exterior cover

A flexible tank's exterior cover should be resistant to UV radiation.

A flexible tank's water taps should be sized to match the entrance size to the essential facility's system that the AWS has been designed to integrate with.

Flexible tanks typically include an air-inlet valve and can include a pressure relief valve.

The shelf-life of a flexible tank is typically 5 years or more.

[Figure B.2](#) illustrates an example of a flexible tank.

B.2.1.4 Flexible tank platform

A flexible tank platform's design should include the following considerations:

- a) transportation: its weight should allow easy carrying;
- b) strength: it should be strong enough to safely support its own and the tank's weight when full;
- c) stability: it should be stable enough to withstand the rigours of attention by users at all stages from standing alone to supporting a full tank of water;
- d) installation: it should allow for safe and easy assembly and dismantling;
- e) height: it should be tall enough to permit full gravitational discharge of the flexible tank's contents via the multi-water tap.



SOURCE Reproduced with permission from the Israeli Water Authority.

Figure B.2 — Flexible tank and platform - type 1

B.2.2 Flexible tank - type 2

Another type of tank is shown in [Figure B.3](#). It can be stored in folded form and inflated with an air pump when it is to be used as a tank. It can be placed on a flat stand to serve as a water well without pumping.



SOURCE Reproduced with permission from the Japan Water Works Association.

Figure B.3 — Flexible tank - type 2

B.2.3 Rigid static tanks

Rigid static tanks are available in a variety of sizes and capacities (see [Figure B.4](#)).

Some static tanks can be earthquake-resistant. This type of static tank can be used safely while earthquakes are occurring (see [Figure B.5](#)).





SOURCE Reproduced with permission from the Israeli Water Authority.

Figure B.4 — Rigid static tanks



SOURCE Reproduced with permission from the Japan Water Works Association.

Figure B.5 — Earthquake-resistant static tank

B.3 Examples of mobile tankers

B.3.1 Flexible tank on a platform truck

B.3.1.1 General

Flexible tanks consist of an exterior cover and a filling bag.

B.3.1.2 Flexible tank exterior cover

A flexible tank's exterior cover:

- a) should be resistant to UV radiation;
- b) has both drain and fill tap; the former's diameter should be at least 50 mm (or in accordance with the filling tap's diameter);

- c) can include a pressure-relief valve;
- d) has a shelf-life of several years (e.g. 5 years or more);
- e) can include an individual water pump;
- f) should include anchoring strips in accordance with the weight of the tank; for example, one strip is typically installed for every metre of the tank's length;
- g) should be robust enough to protect itself and the flexible filling bag from damage (when used in accordance with its handling instructions) for the planned life of the product.

B.3.1.3 Flexible tank's filling bag

The filling bag inside of a flexible tank is typically intended for single use and should be capable of uninterrupted AWS provision for one month or more. At the end of a particular event, the bag is replaced by a new bag or drained and decommissioned for use in subsequent crises. [Figure B.6](#) illustrates such a flexible tank, strapped to a flat-bed truck.

A flexible tank's filling bag should be capable of easy replacement. [Figure B.6](#) illustrates a flexible filling tank strapped to a flat-bed truck.



SOURCE Reproduced with permission from the Israeli Water Authority

Figure B.6 — Flexible tank strapped to a flat-bed truck

B.3.2 Mobile tankers

Mobile water tankers can take many forms, sizes and means of transportation. The tank linings, fittings and accessories should be suitable for contact with drinking water and capable of complete and repeated disinfection over their working lives.

[Figure B.7](#) shows an example of a mobile tanker.



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Figure B.7 — Mobile tanker

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Annex C (informative)

Determining water allocations

C.1 General

To properly plan for and respond to a water crisis requiring AWS provision for essential facilities, the water utility should establish, jointly with the essential facility, the water quantities to be allotted for its ongoing operation.

C.2 Determining the minimum water allocation requirements for essential facilities

To properly plan for and respond to a water crisis requiring AWS provision, the water utility should establish a reasonable period of time necessary for the water utility to recover from the crisis situation and restore a situation of normal or near-to-normal operation.

This determination should be based on a risk assessment relating to a crisis caused by a reasonable serious threat.

The water utility, jointly with each essential facility, should determine the minimum water quantity necessary for the facility to keep supplying and running the essential services and products.

Different services and products can require different water quantities and qualities to fulfil their aim. The required water quantity and quality can be influenced by several factors, including, but not limited to, the nature of the services or products of the essential facility, geographical influences and regulatory or organizational requirements. Therefore, the minimum water quantity for each water quality should be determined in advance.

Once the water utility, jointly with the essential facility, has established the relevant demands, it can derive a minimum quantity for AWS provision to each essential facility and use these results as the basis for the planning of the solution method for the provision of alternative water during a crisis to the essential facilities.

Some examples of determinations of water allocation requirements for essential facilities as practised in Israel are as follows:

- a) 500-bed hospital:
 - 1) The Israeli Water Authority has determined that the period of time for water utilities to re-establish normal or next-to-normal service after a crisis has occurred is 3 days.
 - 2) The health ministry has determined that the minimum water demand of a hospital per bed is about 400 l to 500 l per day.
 - 3) The minimum water quantity to be allotted to allow for a hospital with 500 beds to keep running during a crisis is: $400 \times 3 \times 500 = 600\,000$ l (600 m³).
- b) 250-cow dairy barn:
 - 1) The Israeli Water Authority has determined that the period of time for water utilities to re-establish normal or quite normal service after a crisis has occurred is 3 days.
 - 2) The Ministry of Agriculture has determined that the minimum water demand of a dairy cow is 120 l/d.

- 3) Minimum water quantity to be allotted to allow for a 250-cow dairy barn to maintain milk production during a crisis is: $120 \times 3 \times 250 = 90\,000\text{ l}$ (90 m^3).
- 4) To this quantity, the water demand of the milking facility should be added.

C.3 Redetermining minimum drinking water allocation requirements

C.3.1 General

If possible, water utilities should work with relevant authorities in the planning stages to determine a minimum drinking water allocation for each essential facility that takes into account the basic requirements of the services and products that have to be provided and other regulations. This value can then be used during the crisis to determine the appropriate scale and solution method(s) of AWS provision.

C.3.2 Factors affecting minimum drinking water allocation requirements

Although it is possible that a predetermined value for minimum per-capita drinking water allocation has been established, several factors could require its re-evaluation and, if necessary, its revision to address users with special needs. These factors include consideration of the needs of users who have a requirement for a greater quantity of drinking water, such as young children, pregnant or breastfeeding women, the elderly and people with certain illnesses who can have increased fluid requirements. Vulnerable users can be pre-identified by the water utility or can self-present during the crisis. Also, hydration levels are greatly affected by the climatic conditions and the amount of activity and associated thermal stress experienced by a user. These can result in an increased drinking water allocation being required.

C.4 Additional factors in determining drinking water allocation beyond human health

Although the main purpose of AWS provision is satisfying the provision of the essential services and products that are provided by the essential facilities to the community, the reduction of provided water quantity should also be considered.

The water utility could, for example, determine it necessary to supply water for non-drinking water usage with appropriate warnings about such usage, or it could inform the essential facility of precautions for using potentially bacteriologically contaminated water, such as boiling water (and cooling as necessary) before use for drinking, bathing or food preparation.

Consideration can be given to water allocation for drinking purposes at locations that remain functioning during the water crisis. It can be necessary to provide extra supplies to essential workers involved in the restoration of services to the area, see ISO 24527.^[3]

As each individual crisis is unique, any predetermined drinking water allocation (above any minimum regulatory requirement) could be increased or decreased by the water utility for all or some of the essential facilities during the crisis, depending on the situation and availability of the water resources.

The conditions of the crisis should be monitored beyond the regular assessment of whether the base requirement is being met. The water allocation should be adjusted upwards, where possible, with the goal of returning to normal supply conditions.