BS 8551:2015

BSI Standards Publication

Provision and management of temporary water supplies and distribution networks (not including provisions for statutory emergencies) – Code of practice

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Contents

Summary of pages

This document comprises a front cover, an inside front cover, pages i to vi, pages 1 to 54, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 30 September 2015. It was prepared by BSI Panel EH/3/-/1, *Panel for BS 8551*, under the authority of Technical Committee EH/3, *Water quality*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

BS 8551:2015 supersedes BS 8551:2011, which is withdrawn.

Information about this document

This is a full revision of the standard to keep it up to date.

This document is intended for application when there is a temporary loss of a piped water supply or where there is a limited or no piped water supply available that is not the responsibility of a water undertaker or licensed water supplier (e.g. burst of private supply pipe). It is also intended to be applicable to the provision of temporary water distribution systems for public events or construction sites.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

All personnel involved in the deployment and use of tankers, static tanks and bowsers (for drinking water purposes) are expected to hold the National Water Hygiene Card (see https://www.eusr.co.uk/eusr/the-eusr-card/the-national-water-hygiene-card) [viewed: 14 September 2015].

Test laboratory accreditation. Users of this British Standard are advised to consider the desirability of selecting test laboratories that are accredited to BS EN ISO/IEC 17025 by a national or international accreditation body.

A list of accredited laboratories is provided at www.dwi.gov.uk [viewed: 14 September 2015].

WARNING. This British Standard calls for the use of substances and/or procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

The word "should" is used to express recommendations of this standard. The word "may" is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the Clause. The word "can" is used to express possibility, e.g. a consequence of an action or an event.

Notes and commentaries are provided throughout the text of this standard. Notes give references and additional information that are important but do not form part of the recommendations. Commentaries give background information.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

In particular, attention is drawn to the following statutory regulations.

- Water Industry Act 1991 [1];
- The Water and Sewerage Services (Northern Ireland) Order 2006, as amended [2];
- The Water (Scotland) Act 1980, as amended [3];
- Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption [4];
- The "Water Quality Regulations", which set out provisions for the quality of drinking water provided by a public water supplier (water undertaker):
    - The Water Supply (Water Quality) Regulations 2000, as amended, in England [5];
    - The Water Supply (Water Quality) Regulations 2010, as amended, in Wales [6];
    - The Water Supply (Water Quality) Regulations (Northern Ireland) 2007, as amended, in Northern Ireland [7];
    - The Public Supply Water Supplies (Scotland) Regulations 2014, in Scotland [8];
- The "Private Water Supplies Regulations", which set out provisions for the quality of water from a private supply:
    - The Private Water Supplies Regulations 2009, as amended, in England [9];
    - The Private Water Supplies (Wales) Regulations 2010, as amended, in Wales [10];
    - The Private Water Supplies (Northern Ireland) Regulations 2009, as amended, in Northern Ireland [11];
    - The Private Water Supplies (Scotland) Regulations 2006, in Scotland [12];
- The "Water Fittings Regulations", which set out provisions for plumbing systems in premises to which a supply of public mains water has been provided:
    - The Water Supply (Water Fittings) Regulations 1999, in England and Wales [13];
    - The Water Supply (Water Fittings) Regulations (Northern Ireland) 2009, in Northern Ireland [14];
    - The Water Supply (Water Fittings) (Scotland) Byelaws 2014, in Scotland [15];
- The Natural Mineral Water, Spring Water and Bottled Drinking Water (England) Regulations 2007, as amended [16];
- The Natural Mineral Water, Spring Water and Bottled Drinking Water (Wales) Regulations 2007, as amended [17];

- The Natural Mineral Water, Spring Water and Bottled Drinking Water (Northern Ireland) Regulations 2007, as amended [18];
- The Natural Mineral Water, Spring Water and Bottled Drinking Water (Scotland) Regulations 2007, as amended [19];
- The Workplace (Health, Safety and Welfare) Regulations 1992 [20];
- The Control of Substances Hazardous to Health Regulations 2002 (COSHH) [21];
- The Control of Substances Hazardous to Health Regulations (Northern Ireland) 2003 [22];
- The Health and Safety at Work etc. Act 1974, as amended [23].

NOTE Bottled water held in storage for emergency uses has to be suitable for supply under the same Regulations [5], [6], [7] and [8] as that which is supplied though the distribution network.

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0 Introduction

The provision of safe, clean drinking water is essential to support public health and well-being.

Where there is a need to provide a temporary supply of water for domestic purposes [1)] (i.e. drinking, washing, cooking, central heating and sanitary purposes) this British Standard provides guidance which, if followed carefully, can help ensure the wholesomeness [2)] of the temporary water supply.

Temporary water supplies can be provided by various means, including:

- water delivered in bottles, containers, tankers, bowsers, static tanks; or
- piped supplies from a public main; or
- water delivered as above, but derived from a private source, such as boreholes, springs, wells and river abstraction schemes.

Water supplied by a licensed water undertaker needs to conform to the Water Quality Regulations [5], [6], [7] and [8]. Any water fitting supplied with water by a water undertaker has to conform to the Water Fittings Regulations [13], [14] and [15]. Water supplied by an alternative source, such as a private water supply, needs to conform to the Private Water Supply Regulations [9], [10], [11] and [12]. Water supplied via a stand-alone vessel or tanker is not covered by these Regulations. However, it is necessary that all installations, regardless of source, satisfy the provisions of the Water Fittings Regulations [13], [14] and [15].

This standard acknowledges the duty to ensure that temporary supplies are wholesome.

This standard gives guidance on the provision of an appropriate management system(s) for temporary water supplies capable (through documentation) of demonstrating to the water supplier and/or the local authority that all necessary procedural steps have been carried out.

Management systems assist in ensuring wholesomeness of the water supplied and demonstrate due diligence by the relevant people (for private supplies) or the water undertaker (for public supplies) in relation to Water and Health and Safety Law [3)] as it applies to temporary water supplies.

Guidance is also given on the preparation and use of temporary water transfer vessels which can be pre-prepared and stored ready for collection and deployment, either for stand-alone use or for connection to a temporary network.

In addition to the temporary supply of wholesome water, this standard covers methods of extraction of water from a wholesome supply and its subsequent transfer to the point of use.

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1) As defined in the Water Industry Act 1991, as amended (for England and Wales) [1], and corresponding Acts in Scotland and Northern Ireland [2] and [3].

2) As defined in the Water Quality Regulations [5], [6], [7] and [8] or the Private Water Supplies Regulations [9], [10], [11] and [12] depending on where the water is sourced.

3) Those responsible for the provision of temporary supplies are subject to the requirements of the Health and Safety at Work etc. Act 1974 [23].

1 Scope

This British Standard gives recommendations and guidance for the provision and management of temporary water supplies and distribution networks to ensure the water supplied for domestic purposes is wholesome. It is applicable to situations when a permanent supply is insufficient, not available or not required, for example, at building sites and outdoor public events.

NOTE The drinking water regulators, water undertakers and local authorities have in place collective arrangements for dealing with operational events, incidents and emergencies in relation to both public and private water supplies, and they ought always to be informed and/or consulted before a temporary water supply arrangement is put in place.

The standard gives recommendations and guidance on procedures and documentation for:

a) risk assessment and management;

b) supplying, maintaining and cleaning vessels used to collect and transport wholesome water or function as temporary supply points;

c) storage and quality control of bottled water stocks intended for temporary supply;

d) connecting to a permanent distribution network for extraction purposes, avoiding contamination risks;

e) installing temporary water storage vessels and temporary pipework for distribution networks serving temporary water draw-off points whilst avoiding contamination risks; and

f) monitoring and sampling.

This British Standard is intended to provide guidance on good practice related to anticipated temporary water supplies and installation of temporary distribution networks, but its principles are applicable to contingency arrangements for water supply incidents and emergencies.

The British Standard also gives guidance on water supply hygiene and management practices which can involve staff training and/or operational procedures.

The British Standard relates to the supply of water that has already been treated to make it safe for drinking, and its provisions are intended to prevent contamination.

The British Standard is not applicable to:

1) the use and maintenance of large-bottle water dispensers, for example, the bottles often used in office water coolers/dispensers (although the management of stocks of water held for use in such devices is covered);

2) the dispensing of the water supplied from vessels which are managed outside a predefined management regime, such as:

   i) personalized utensils (for example, sports water bottles or personal filters);

   ii) personal portable containers designed for carrying water; and

   iii) vending machines;

3) the supply of water for the flushing of toilets/urinals only; and

4) the extraction and treatment of raw water from springs, streams, wells, boreholes, lakes, rain or seawater as part of the provision of either a public or private water supply (regulated activity).

2 Normative references

The following referenced documents are indispensable for the application 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.

BS 1710, *Specification for identification of pipelines and services*

BS 6920-1, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water – Part 1: Specification*

BS 6920-2, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water – Part 2: Methods of test*

BS 8550, *Guide for the auditing of water quality sampling*

BS EN 806 (all parts), *Specifications for installations inside buildings conveying water for human consumption*

BS EN 938, *Chemicals used for treatment of water intended for human consumption – Sodium chlorite*

BS ISO 5667-5, *Water quality – Sampling – Part 5: Guidance on sampling of drinking water from treatment works and piped distribution systems*

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1 audit
systematic examination to determine whether activities and related results conform to planned arrangements and whether these arrangements are implemented effectively and are suitable for achieving the organization's policy and objectives

3.2 audit programme
set of one or more audits planned for a specific time frame and directed towards a specific purpose

[SOURCE: BS EN ISO 9000:2005, **3.9.2**]

3.3 available chlorine
measure of the amount of chlorine available in chlorine based disinfection materials

3.4 best before date
advisory date before which the quality of the product is assured by the producer

NOTE This is in contrast with a use-by date or best-by date which indicates that the product is no longer fit for use after a specified date.

3.5 biofilm
structured community of microorganisms encapsulated within a self-developed polymeric matrix and adherent to a living or inert surface

NOTE Environmental organisms adhere to the surfaces of all types of material and form an invisible film on the inner surfaces of pipes or fittings. In certain circumstances where conditions for microbial growth are optimal, such biofilms develop to form visible slimes, turbid water or unpleasant tastes and odours. In such situations organisms will be shed into the flowing water.

3.6 clean
domestic standard of cleanliness, free from faecal matter, dirt or any other contaminating substance

3.7 competent person
person deemed to be capable, proficient or expert through training, knowledge and experience

3.8 contact water
water that is stored prior to super chlorination

3.9 customer
individual or organization that has contracted with a supplier to receive temporary water supply services

3.10 deployment log
record of the activities of transferring water into the storage vessel(s)

3.11 disinfection
process which removes or renders inactive pathogenic microorganisms or parasites

3.12 distribution network
permanent network of pipes (often called mains) that convey wholesome water from a public or private water supply treatment facility to a customer service connection or user draw-off point

3.13 emergency supply
immediate unplanned requirement for wholesome water via an alternative water supply method other than that arising from a civil emergency

NOTE Section 208 (7) of the Water Industry Act 1991 [1] defines "civil emergency" as any natural disaster or other emergency which could:

a) disrupt water supplies or sewerage services; or

b) involve destruction of or damage to life or property.

3.14 filling log
record of the activities of transferring water from the filling point into the transfer vessel(s)

NOTE This records "local" journeys only, not those from the base to the filling point, and contains, for example, data, operator, times, water supply and supplier, water company, identity of transfer vessel, chlorine readings, volume and destination/use.

3.15 filling point
chosen fixture providing access to the wholesome water supply to the person or organization providing the temporary water supply

3.16 operator
person qualified to prepare vessels, fill and transfer water into vessels, and connect temporary supplies to a temporary distribution network

3.17 prepared vessel
vessel prepared to ensure that it is clean and, when filled with wholesome water, does not become contaminated

3.18 residual free chlorine
amount of chlorine remaining after a given contact period under specified conditions of dose and time

3.19 responsible person
individual appointed as competent to carry out tasks, or arrange for others to carry out tasks, in relation to the temporary supply of water

NOTE Such persons become "relevant persons" under the water legislation together with the organization or person appointing them.

3.20 service pipe
permanent pipe connection from a public or private water supply main or pipe to a property or a communal user draw-off point

3.21 static temporary supply tank
stand-alone tank that is not connected by pipes to a public or private water supply main or pipe

3.22 storage vessel
temporary or permanent tank or reservoir which is constructed and maintained in a manner that after inspection has been determined as suitable for storing wholesome water

NOTE Suitability includes the type of construction materials, the condition of the structure and the arrangements that safeguard against ingress of environmental matter, rain or surface water, insects, vermin, etc., and minimize the likelihood of deliberate or accidental contamination.

3.23 tamper evident
process that makes unauthorized access to the protected object easily detected

3.24 temporary distribution system
non-permanent network that conveys wholesome water, including pipework, fittings and appliances, installed either above ground or *in situ*, but not those which comprise part of the permanent public or private water supply or the temporary storage tank or vessel which comprises the source of wholesome water for the temporary supply

3.25 temporary wholesome water supply
water deployed from stand-alone temporary vessels (including bottles) for public consumption where no other temporary water infrastructure is involved

3.26 total residual chlorine
sum of the combined chlorine and the residual free chlorine

3.27 testing facility
laboratory for testing water samples

3.28 total viable count (TVC)
estimate of number of bacteria in a sample

NOTE Also known as aerobic plate count (APC) or heterotrophic plate count (HPC).

3.29 transfer vessel
vessel for collecting water from a filling point, transporting water and decanting water into a static temporary supply tank, but which is not left on site and does not comprise part of the temporary water supply infrastructure

NOTE 1 Transfer vessels can be either tankers or bowsers, and are usually transported by road on a flatbed truck or trailer.

NOTE 2 A transfer vessel would normally be used several times in one day.

3.30 water provider
organization providing source water

3.31 water supplier
organization transporting and delivering water

3.32 water technician
competent installer of water supply networks, either mains or temporary distribution systems

NOTE See Annex A for an explanation of competence.

3.33 water undertaker
licensed water provider supplying a water supply via a public mains network

4 Water safety planning and risk management

4.1 General

To ensure the safety of a drinking water supply a comprehensive risk assessment and risk management approach should be followed that encompasses all steps in the water supply from catchment to consumers.

4.2 Roles and responsibilities

*COMMENTARY ON **4.2***

Organizers are responsible for securing a wholesome and sufficient supply for any temporary installation. Possible water sources include a connection to the mains water supply, tankers, bowsers or bottled water which could derive from public or private water supplies.

A wholesome supply is defined in the Water Quality Regulations [5], [6], [7] and [8] and the Private Water Supplies Regulations [9], [10], [11] and [12], as one that does not contain any microorganism or parasite, or any substance at a concentration or value that would constitute a potential danger to human health. A sufficient supply is one which is adequate for normal domestic purposes, defined in section 218 of the Water Industry Act [1] as water used for drinking, washing, cooking, central heating and sanitary purposes.

For connections to the public water supply, the water undertaker will already have risk-assessed the catchment, treatment and distribution elements of the supply under the current applicable water regulations. Therefore a temporary installation derived from a public water supply should be risk-assessed from the point of connection to the water main onwards, including any additional treatment, storage and distribution elements installed as part of the event.

NOTE For a temporary installation originating from a private water supply (e.g. private borehole) the local authority is required to carry out a risk assessment of the catchment, treatment, storage and distribution elements of the supply.

4.3 Components of a water safety plan (WSP)

To ensure that a supply is safe, the WSP should comprise, as a minimum, the following responsibilities of the organizers:

a) a system assessment to identify potential hazards in each part of the supply system, the risk presented by those hazards and any control measures to control those risks;

b) effective operational monitoring (see Clause **11**) of an appropriate frequency and nature to identify any deterioration in the supply; and

c) management and communication, including actions in the event of non-compliance with the standards, investigation protocols, remediation measures, reporting and communication.

4.4 Preparing a water safety plan

The WSP should be prepared in accordance with Figure 1.

NOTE Guidance on water safety planning and risk assessment is available from:

- *WHO* Guidelines for Drinking-water Quality *[24], fourth edition, chapter 4;*
- *WHO* Water safety plan: a field guide to improving drinking-water safety in small communities *[25]; and*
- *DWI Guidance Note,* A Brief Guide to Drinking Water Safety Plans *[26].*

4.5 Risk assessment

A risk assessment should be carried out in accordance with a) to d) and the measures recommended in e) to h) implemented, to ensure a wholesome and sufficient supply that conforms to the water industry legislation [1], [2] and [3]. Any organization commissioned to provide a temporary water supply should be competent. As well as ensuring it is operating in accordance with this British Standard, the employees of the organization should undergo the appropriate training in various aspects of water supply, in accordance with Annex A.

a) **Securing a sufficient supply**

The first stage in the risk assessment process should be to ensure that an adequate supply has been secured. Discussions about sufficient supply should take into account water required for the preparation of the site/event, e.g. flushing of fittings. If a connection to the public water supply is required organizers should contact the relevant water company at least 12 weeks prior to the event.

If water for the event is to be taken from an existing connection to the public water supply (e.g. a farm where additional pipes are used to supply marquees and catering units) the local water company should still be notified (see Commentary on **8.2**) of the additional demand in the area.

NOTE 1 As part of the connection process, the water undertaker will undertake a risk assessment.

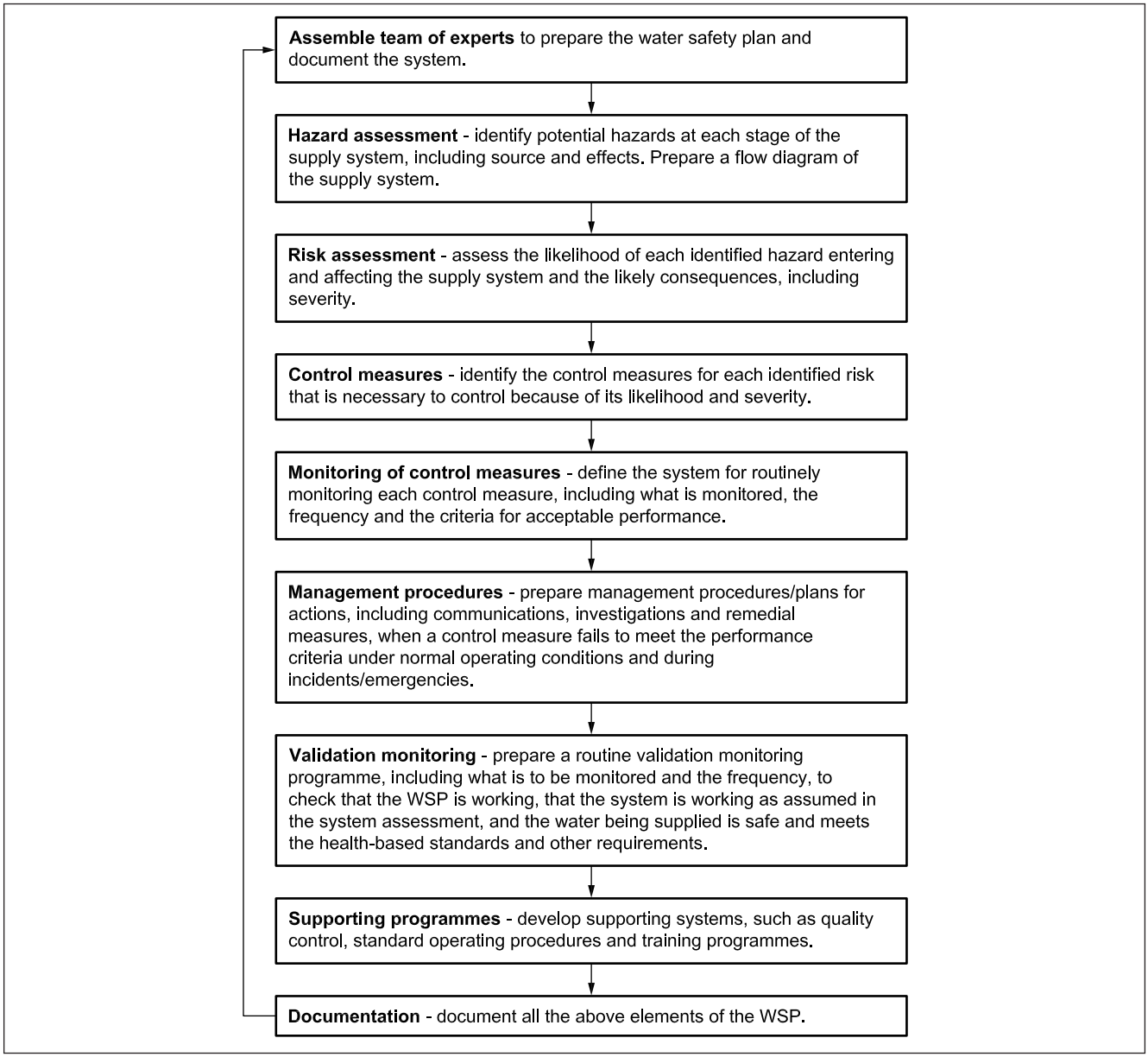
If the event is to be supplied via tankers or bowsers from a public water supply, permission should be obtained from the local water company (see Clause **7** on filling of vessels).

NOTE 2 To ensure a sufficient supply, Annex B provides the typical flow demands in litres per day of various uses of the supply. Using information about intended use and population to be supplied the overall requirement in litres per day can be calculated.

The WSP should set out the actions to be taken in the event of insufficiency of supply due to drought, mains fracture, sample failure, risk to public health, etc.

(see DWI Technical Guidance Note, *Provision of alternative supplies in emergency and non-emergency situations* [27]).

Figure 1 **Preparing a water safety plan**



b) **Assessing the temporary supply**

All relevant information should be gathered about the supply system, the distribution network, any storage facilities and its operational control, including:

1) storage tank design (capacity, number of units, position of inlets/outlets), material of construction and retention time;
2) a schematic of the supply;
3) protection from unauthorized human and animal access to service reservoirs, such as hatches, and from surface water ingress;
4) materials of the network;
5) normal range of pressures, flows, water age and retention time;
6) normal method of operation and permitted variations to suit demands for water;

7) condition of distribution network (upstream of any connection plus within the event location); and

8) location of monitoring and sampling points.

c) **Hazard identification**

The next step of the risk assessment should be the identification of the hazards that could arise during the distribution of water to consumers.

NOTE 3 Some examples are given in Table 1.

Table 1 **Possible hazards**

Source of hazard
Direct mains connection
Sediment in the mains water
Taste or odour in the mains water (descriptor and likely cause)
Stagnant water (low flows, dead legs)
Sufficiency of supply
Mains water used to fill vessels
Hoses – condition, storage, disinfection, labelling, approved material
Filling points – location/hygiene
Private supply (refer to local authority risk assessment for the supply)
Vicinity of oil tanks/fuel stores, etc.
Land use (exposure to faecal material/pesticides/heavy metals, etc.)
Naturally occurring chemicals in ground water, e.g. arsenic and fluoride
Faecal contamination from livestock, wild animals, etc.
Storage
Inappropriate vessels used
Vessels inadequately disinfected, sampled or sealed
Vessels constructed of unapproved materials
Storage of fuel, oil, etc., adjacent to storage vessels
Exposure to sunlight (algae, temperatures)
Exposure to physical damage, e.g. vehicles
Insufficient supply
Vandalism
Security arrangements
Malicious activity
Faecal contamination from septic tanks, sewers, portable toilets
Distribution
Faecal contamination from septic tanks, sewers, portable toilets
Creation of disinfection by-products
Stagnant water from dead legs
Backflow from standpipes, catering units, etc.
Damage of pipes by sunlight, vehicles, vermin, vandalism, etc.
Storage of fuel, oil, etc., adjacent to pipes (migration of hydrocarbons)
Cross-connection to other systems, e.g. rainwater harvesting, grey water, etc.
Corrosion of pipes (iron, lead, copper)

d) **Assess risk**

The next step should be to assess the likelihood and severity of risk associated with each identified hazard and rank these risks in priority order.

e) **Control measures**

Following the risk assessment, the control measures necessary for the storage units or within the distribution network to reduce or eliminate the risk should be identified.

NOTE 4 Examples include:

- *operate the network in such a way that minimizes sudden changes in flow and practise routine flushing;*
- *maintain adequate network pressures;*
- *have written procedures for conducting repairs that include appropriate disinfection;*
- *maintain a residual disinfectant throughout the network (if possible) to reduce microbiological growth;*
- *document the status of all valves (open/closed);*
- *carry out a risk assessment before conducting any operation; and*
- *only use approved materials in the network.*

f) **Validation and monitoring of control measures (see Clause 11)**

Each control measure should be validated and monitored, through a plan for sampling and on-site checks, to determine whether it is working properly. Internal audits may be carried out to ensure procedures are being followed. Inspection of installations, the distribution network and regular inspection of the site in general should be scheduled and documented.

g) **Supporting programmes**

Appropriate supporting programmes should be implemented, such as:

1) training staff in water safety planning, procedures;
2) developing appropriate operational procedures; and
3) quality control procedures.

h) **Management procedures**

The WSP should define the actions to be taken in response to variations that occur during normal operating conditions, actions to be taken during incident situations, and procedures to be followed in unforeseen or emergency situations.

NOTE 5 Where a critical limit is exceeded during operational monitoring this is often referred to as an "incident". This is any situation where the water being supplied for drinking or other domestic purposes has or might have become unsafe. Incident triggers include:

- *non-compliance with monitoring criteria;*
- *spillage of hazardous substances into the water;*
- *failure of power supply to an essential control measure;*
- *unusual taste, odour or appearance of the water;*
- *disease outbreak; and*
- *detection of faecal indicator organisms.*

Incident response plans are likely to require the resources of organizations other than the organizer, e.g. public health agencies, so management procedures should include:

1) accountabilities and contact details of key personnel;
2) indicators/limits/triggers;
3) actions required in response to the alerts;
4) location of operating procedures and equipment;
5) checklists; and
6) criteria and mechanism to deliver advice (boil water, do not drink, do not use).

NOTE 6 Incident response plans can have a range of alert levels, the most serious of which is an emergency.

4.6 *Legionella*

*COMMENTARY ON **4.6***

Risk assessments are a health and safety at work requirement.

4.6.1 Where the water supply system could produce an aerosol (droplets) that might be inhaled, e.g. showers, pressure jetting and other spray or irrigation systems, then the water supply arrangements should prevent standing water, poor turnover or excessive storage, poor flow through the vessels, and silt or scale, as these conditions encourage the growth of *Legionella* organisms.

NOTE 1 Poorly fitted vessel lids can allow organic matter to enter the vessels, which in turn will encourage bacterial growth.

NOTE 2 Following the recommendations of this code of practice contributes to reduction of the risk of legionella proliferation. See also BS 8580, HSE Approved Code of Practice and guidance L8 [28] and HSG274 Part 2 [29].

4.6.2 A *Legionella* risk assessment should be carried out following the installation of a temporary system, and regular monitoring of the installation maintained until decommissioning.

5 Medical assessment and water quality hygiene awareness training

All operational personnel involved in the provision of a water supply should be subject to scrutiny and training outlined in Annex A, and be competent to connect a supply.

6 Quality assurance documentation

6.1 Because water might have been consumed before the results of testing active containers are known, a traceable audit trail should be maintained, demonstrating the application of good hygiene practice in the management and servicing of all related equipment and installation of the supply.

6.2 Robust systems should be put in place to record and monitor test results of pre-cleaned vessels and stored bottled water. The water supplier should produce a hard or digital copy of a list of the quality checks that have been carried out on any temporary wholesome water supply to allow:

a) an end-user to follow the tests that have been undertaken on that water and equipment during transportation from wholesome supply to point of use; and

b) speedy audit by supervisors at any stage during the provision process.

6.3 The results of microbiological tests should also be recorded when they become available during deployment.

6.4 The operator should record data on site during the transfer process and whenever maintenance to vessels or equipment is carried out, including disinfection, as well as any action which might potentially affect water quality, such as replacement of connection couplings or pipes. The record forms should be designed to ensure that the operator can review the operational history of each vessel and item of equipment in order to trace the source of water supplied on any occasion to any site.

NOTE For temporary supplies for public events the local authority requires a schematic drawing of the water supply arrangements as part of the risk assessment.

7 Wholesome supply suitability

7.1 General

NOTE 1 The supply of all water is subject to availability from the local public or private water supply company and local extraction licence agreements.

Because the water company can restrict access to the public water supply, unless specifically authorized, the operator should seek clearance to draw water on every occasion, unless the licence granted by the water company is open for use in all areas within its area of supply.

NOTE 2 Some water undertakers limit the size of hydrant standpipe to be used in order to prevent high-flow extraction and reduce the risks to the network to acceptable standards.

7.2 Connection to source water

*COMMENTARY ON **7.2***

*As explained in **7.1**, the operator requires a valid licence (under the Water Industry Act [1]) to draw off water from a public water distribution network, and this is notifiable under Regulation 5 of the Water Fittings Regulations [13], [14] and [15].*

7.2.1 In the case of a regulated private supply the operator should obtain:

a) evidence from the local authority that the supply is suitable; and

b) the permission of the owner/manager.

7.2.2 Equipment used for draw-off should be clean, disinfected and sealed (if stored before use) to avoid contamination of the water. Standpipes should have a permanently installed, double-check valve in line to prevent backflow. Only standpipes of a type approved by the water company should be used.

NOTE The same principles regarding equipment also apply to private water supplies.

7.2.3 Only equipment conforming to the Water Fittings Regulations [13], [14] and [15] should be used to make the connections. The equipment should be

disinfected before use. Final connectors should be sprayed with 1 000 mg/L free chlorine solution and allowed to stand for 2 min in a manner that protects from contamination (e.g. by being placed on or in a new, clean plastic bag, not placed directly on the ground), then flushed for 2 min before connection to the transfer vessel to remove residual chlorine. Records of all draw-offs should be maintained for each vessel.

7.2.4 Hoses used to draw off wholesome water should conform to BS 6920 and:

a) be labelled for use with the words "drinking water only" in letters of at least 13 mm font size at each connecting end;

b) be handled with care to prevent contamination;

c) be flushed before use and drained after each use;

d) not be used for any other purpose; and

e) stowed rolled tight with the ends capped on reels or racks, or with ends coupled together in storage lockers not used for any other purpose.

7.2.5 All hoses, fittings, water filters and associated equipment used for connection with the storage of wholesome water should be:

a) constructed of compliant, easily-cleanable materials (see Water Fittings Regulations [13], [14] and [15]);

b) maintained in good repair; and

c) handled and stored in a sanitary manner.

7.2.6 Wholesome water hose lockers should be:

a) constructed of smooth, non-toxic, corrosion-resistant and easily-cleanable material, and should be maintained in good repair;

b) self-draining; and

c) used for no other purpose than storing wholesome water hoses, fittings and associated equipment.

7.2.7 The locker doors should be closed when not removing hoses and equipment.

7.3 Prevention of contamination

7.3.1 Wholesome drinking water is particularly vulnerable to contamination during tanker/vessel filling and discharging operations, so standpipes, hoses and fittings should be protected from contamination. Hose nozzles (delivery end) should be prevented from becoming contaminated through, for example, being laid on the ground or on surfaces that can impart contamination. This can be achieved, for example, by laying the hose nozzle on clean plastic sheeting or kept immersed in a suitable disinfectant solution prior to use. The primary concern should be to ensure that the tankered water does not compromise the health of those drinking/using it.

7.3.2 In an emergency, tankers normally used for the transport of food grade liquids (see **9.2**) can be used, but should be subject to additional washing, disinfection and flushing depending on the previous use.

7.4 Wholesome supply

7.4.1 Water should be drawn off from either a public water supply mains distribution system or a private water supply network deemed suitable by the local authority.

NOTE Public supplies usually contain a residual free chlorine concentration greater than 0.20 mg/L and not in excess of 1.0 mg/L (chlorinated supply).

7.4.2 The free and total chlorine residual should be recorded in a filling log, together with the operator's name, the time and the location of the extraction, and the vehicle or tank details.

7.4.3 If free chlorine concentrations lower than 0.2 mg/L are measured at the draw-off point this might mean that the residual chlorine in the public supply is in the form of monochloramine (chloraminated supply) or that the private supply is disinfected by ultraviolet (UV). The operator should obtain this information from the water company or the owner/manager so that the relevant measurements can be made and the results correctly interpreted.

7.4.4 Where the supply does not contain free residual chlorine then it is possible to boost the residual concentration (to not greater than 2.0 mg/L) (see **9.5.2**) to a concentration suitable for preserving the water quality during subsequent transport and short-term storage in temporary vessels. For a chloraminated supply the water company should be consulted about the procedure required to achieve the appropriate chlorine residual.

NOTE Adding chlorine to water with a chloramine residual without obtaining technical advice can result in the formation of undesirable chemicals (disinfection by-products) and taste problems.

7.5 Low initial disinfection residuals

*COMMENTARY ON **7.5***

When chlorine is added to water, some of the chlorine reacts first with trace organic and other substances in the water and is not available for disinfection. This reaction is called the chlorine demand of the water. This demand is normally small if the water supply is wholesome. The remaining concentration after the chlorine demand is accounted for is called total residual chlorine.

Total residual chlorine is further divided into:

a) the amount of chlorine that has reacted with nitrogen and is unavailable for disinfection which is called combined chlorine; and

b) the free residual chlorine, which is the chlorine available to render disease-causing organisms inactive.

7.5.1 The residual free chlorine should be measured in the sample with the minimum delay and without excessive exposure of the sample to sunlight.

NOTE The free residual chlorine content of stored water decreases gradually with time (the effect is greater with rising temperature), but can decrease rapidly in the presence of nitrogen-containing substances.

7.5.2 Where residual chlorine concentrations of less than 0.10 mg/L, free or total, are encountered in the water supply, particularly at the end of long runs of mains, the first course of action should be to verify the residual by repeating the chlorine measurements. If the low concentrations are confirmed then the water company or private supply owner/operator should be consulted to determine whether this is normal for this supply. Consideration should be given to using an alternative water supply source or, if none is available, boosting the total chlorine value to a concentration of not less than 0.2 mg/L and not greater than 2.0 mg/L. Where chloraminated water (see Annex C) is used, chlorine concentrations should not be boosted.

8 Installation of temporary distribution systems

8.1 Network design

8.1.1 The design of the network should take account of the feasibility of accessing water on site. If the water supply is insufficient or inadequate an alternative source should be sought, taking account of the practicality of transportation.

8.1.2 A risk assessment should be carried out to consider the hazards that could arise from installing the planned temporary network at the specific site. Such a risk assessment should determine the most suitable design to provide wholesome water for public use, whether it be drinking water, catering requirements or hand washing facilities (see **4.5**).

NOTE All pipework, storage cisterns and associated fittings need to be compliant with Regulation 4 of Regulation/Byelaw 4 of the Water Fittings Regulations [13] and, as applicable, Regulation 31 of the Water Quality Regulations in England and Wales [5] and [6], Regulation 30 of the Water Quality Regulations in Northern Ireland [7] or Byelaw 33 of the Public Supply Water Supplies (Scotland) Regulations 2014 [8].

8.1.3 Pipework should be readily identifiable through the correct pipe marking in accordance with BS 1710. Evidence of conformity may be presented in the form of WRAS approval certification. Disinfection logs and maintenance records should form part of the quality assurance documentation of each piece of equipment.

8.1.4 Adequate backflow protection devices should be installed between the temporary installation and the supplying network. For a larger temporary network it is prudent to add additional backflow devices in zones following an evaluation of risk, and these should be included within the WSP.

NOTE It is the responsibility of the water technician to provide point-of-use backflow protection where there is a risk of localized contamination caused by backflow.

8.1.5 Consideration should be given to insulation of the temporary network, taking into account time of year and duration of the event.

8.2 Notification

*COMMENTARY ON **8.2***

Prior to commencing the installation of the network for a temporary event which is intended to be supplied by a water undertaker, notification needs to be submitted by the event organizer to the relevant water company under Regulation/Byelaw 5 of the Water Fittings Regulations [13], [14] and [15]. The notification needs to take place 10 working days before the commencement of any work.

Installations supplied by a private supply need to be notified to the local authority for risk assessment and monitoring in line with the Private Water Supplies Regulations [9], [10], [11] and [12].

8.2.1 Notification of the installation of the network for a temporary event to be supplied by a water undertaker should provide information about the network design, water fittings, the intended date of commencement and the details of the contractor.

*NOTE The selection of a competent water contractor to carry out the installation and management of the temporary installation is the responsibility of the event organizer. Recommendations for the selection and suitability for this role are referenced in Clause **5**.*

Notification to the water undertaker might be possible after installation in line with certain plumbing approval schemes.

8.2.2 Where a local authority is notified of installations supplied by alternative sources through event licence applications for which it enforces food law, it should ensure that an adequate risk assessment and monitoring plan are included in the licence conditions.

8.3 Installation

Installation should be carried out by competent persons.

NOTE Competency can be demonstrated by membership of an approved contractors scheme, such as those registered with WaterSafe or individual water undertakers' schemes, or possession of a valid National Water Hygiene Card (see Annex A and the EUSR website [4)]*.*

8.4 Management of network

8.4.1 The temporary water network should be cleaned and disinfected in accordance with Clause **10**.

NOTE Further information on cleaning and disinfection is given in BS EN 806-4.

8.4.2 A monitoring and sampling regime should be established that provides a true representation of the quality of the water supply. Specific outlets should be regularly monitored for physical and chemical parameters in accordance with Clause **11** throughout the period the supply is in use.

8.5 Contingency

*COMMENTARY ON **8.5***

Where the temporary network is fed from a public water supply the responsible water company for that region is the enforcing body and can issue notices for non-compliance with the Water Fittings Regulations [13], [14] and [15], and could disconnect or restrict use of the supply.

If the incoming source is a private supply, the local authority is the enforcing body for non-compliance under the Private Water Supplies Regulations [9], [10], [11] and [12], with powers to serve notice under the water industry legislation [1], [2] and [3].

Wherever a temporary supply of water is provided, a contingency plan should be established to detail the arrangements for ensuring a wholesome water supply is available whenever there is an insufficient or inadequate water supply.

8.6 Installation of wholesome water infrastructure main supplies for exhibitions, shows and event concession networks

8.6.1 General

*COMMENTARY ON **8.6.1***

This subclause covers temporary water supplies used in exhibitions, events and shows for use on stands, displays, features or exhibits, including water supplies for industrial, food preparation and other specialist services. Such installations may be installed indoors or outdoors within permanent or temporary structures. It does not apply to the permanent infrastructure network that conveys the wholesome water for the building, if any, in which the exhibition, event or show takes place.

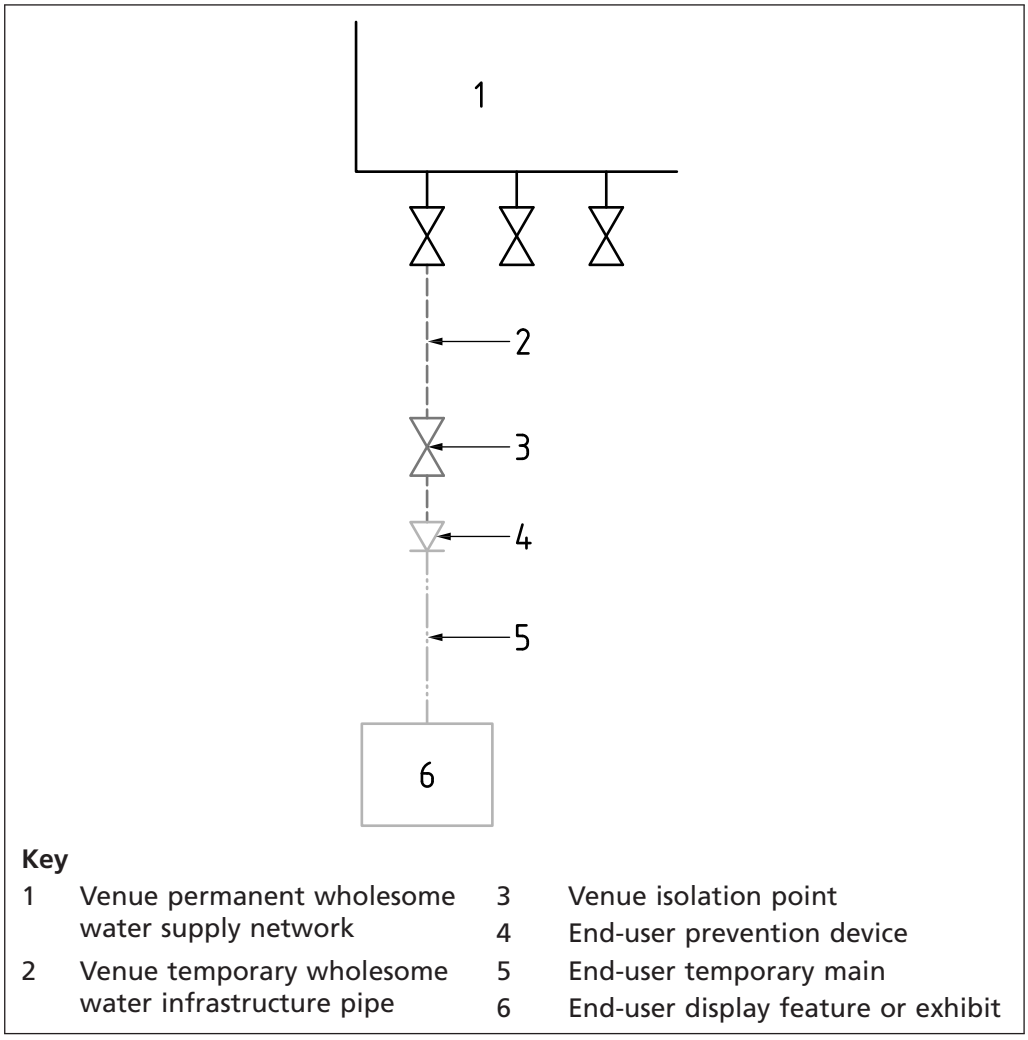
[4)] https://www.eusr.co.uk/eusr/the-eusr-card/the-national-water-hygiene-card [viewed: 14 September 2015].

The temporary water supply installation for exhibitions, events and shows should comprise the following two parts (see Figure 2):

a) venue temporary wholesome water infrastructure main: the temporary mains supply pipe from the venue's permanent wholesome water infrastructure network to the end-user's stand, display, feature or exhibit location, terminated by the venue with an isolation valve at a time and place agreed with the end-user (customer); and

b) end-user (customer) temporary main: the pipework and fittings from the venue temporary wholesome water infrastructure main to the end-user (customer) appliance, display, feature, exhibit, tap or other point of discharge.

Figure 2 **Temporary supplies for exhibitions, shows and events**



Key

1	Venue permanent wholesome water supply network	3	Venue isolation point
		4	End-user prevention device
2	Venue temporary wholesome water infrastructure pipe	5	End-user temporary main
		6	End-user display feature or exhibit

8.6.2 Venue temporary wholesome water infrastructure main

8.6.2.1 Venue domestic mains water should be supplied through a water supply pipe, and be terminated with a stopcock or valve with a threaded connection the same size as the hose and adequate protection to prevent backflow of fluids to other parts of the system.

NOTE See the Water Fittings Regulations [13], [14] and [15].

8.6.2.2 Each venue temporary water mains supply should be uniquely identified at its source with the stand number or destination point, to facilitate a rapid response if it becomes necessary to isolate the supply in an emergency (e.g. a leak).

8.6.3 End-user (customer) temporary connection

8.6.3.1 The installation of the customer's temporary water supply should be cleaned, disinfected in accordance with Clause **10**, and sampled to ensure that the temporary water supply remains wholesome through to the tap or other point of discharge.

8.6.3.2 All temporary supply water fittings and pipework used in the installation should be of an appropriate quality and standard, and be suitable for the circumstances in which they are used.

NOTE The fittings and pipework are also required to conform to the Water Fittings Regulations [13], [14] and [15].

8.6.3.3 The end-user should ensure that any facilities to which the water is to be supplied from the venue temporary water main isolation valve are clean, disinfected in accordance with BS EN 806 (all parts) and sampled to ensure that the temporary water supply remains wholesome through to the display, feature, exhibit, tap or other point of discharge.

8.6.3.4 Prior to bringing the supply into service the end-user should confirm to the venue that the fittings and pipework are compliant, and be capable of providing documentary evidence to demonstrate that cleaning, disinfection and sampling of the services have been undertaken as part of due diligence and in accordance with local authority requirements.

8.6.3.5 The end-user should protect the venue's permanent wholesome infrastructure network from contamination by ensuring that adequate backflow protection is provided, such as a double-check valve to stop potentially contaminated water getting into other parts of the system. The venue should ensure that adequate backflow protection has been fitted and that failure to install such protection results in restrictions to the venue infrastructure.

NOTE If the temporary supply is serving a public event then the responsible person for the event will have agreed arrangements in advance with the local authority as part of the public event licence and other legal requirements in relation to, for example, food, drinks, health and safety and site security. See Annex D for information required to manage the provision of a temporary water supply.

8.7 Decommissioning temporary installations

8.7.1 The temporary network should be disconnected back to the first double-check valve at source.

8.7.2 Care should be taken when dismantling the connection to prevent cross-contamination and to reinstate to original status.

8.7.3 If a temporary network is to be reused, it should be transported, stored and cleaned in accordance with Clause **9**. Care should be taken to avoid contamination during breakdown and transportation.

9 Vessels for storage and transport of water

*COMMENTARY ON CLAUSE **9***

Those involved in the following activities could be subject to local operational procedures.

9.1 Choice and control of suitable vessels

9.1.1 The water supplier should only deploy individually identifiable vessels which have been pre-cleaned, disinfected, sampled and sealed.

9.1.2 The water supplier should have appropriate procedures in place for this process and records of all prior maintenance, sample test results and previous deployment activities of each vessel.

9.1.3 All products, substances and materials in contact with water intended for human consumption should be of an approved type (see Note). Non-metallic materials in contact with water intended for human consumption should conform to BS 6920-1 and BS 6920-2.

NOTE Approval of materials is governed by the Public and Private Water Supply Regulations [5]–[12]. The Drinking Water Inspectorate (DWI) publishes a List of Approved Products for use in Public Water Supply in the United Kingdom [30] and similar information relating to private water supplies.

Equipment approved for use in emergencies by water undertakers is listed in the SoS List of approved products and can be found at: http://www.dwi.gov.uk/ [viewed: 14 September 2015].

9.1.4 All storage vessels should be suitable for the circumstances in which they are to be used. Materials should be suitable for drinking water use and, where storage vessels are exposed to light, they should be of an opaque material that prevents light accessing the water, which could result in algal growth and water quality issues.

9.1.5 Unless made of approved materials suitable for the circumstances, international bulk containers (IBCs) should not be used in the provision of wholesome water.

NOTE Typically, ICBs are not manufactured of appropriate materials and do not prevent sunlight gaining access to the water which could result in algal growth and water quality issues.

9.1.6 In many temporary supply situations, water is likely to be needed for use immediately, so water quality is dependent on careful application of appropriate operating procedures, and documentation and auditing in the event of any subsequent quality complaints or adverse microbiological results. In particular, records of disinfectant dose and residuals should be maintained throughout the process from collection to the point of use. This might require collation of results from different organizations. Where water is likely to be standing for 24 h and not longer than 7 days, the target concentration of residual chlorine (free or total residual, depending upon whether the water is chlorinated or chloraminated) in the vessel, should be set appropriately to preserve water quality during storage.

9.1.7 To monitor residual disinfection concentrations throughout the period of installation and usage, regular checks of disinfection residuals should be implemented after 48 h from deployment. If they fall below 10% of the target concentration at the time of delivery, the water in the tank should be drained and replenished. Replenishment of water should occur in order to make full

contact with all internal surfaces. Wastage of water by drainage should be minimized by usage, so the storage capacity should be proportionate to the estimated usage.

9.2 Tankers

9.2.1 Only tankers constructed to food grade standards (appropriate for transporting drinking water) should be used.

9.2.2 Dedicated wholesome water tankers or tankers used for the carriage of food grade products should be utilized only after provision of an appropriate cleaning certificate.

9.2.3 Tankers used for transporting wholesome water should be of a type that does not affect the taste or odour of the water, release harmful chemicals into the stored water, or permit visible and ultraviolet wavelengths to pass through.

9.2.4 Under no circumstances should tankers used for waste water, drainage or gully sucking be utilized for transporting wholesome water.

NOTE 1 Tankers that have been used for "food grade" storage and transportation may be considered for use. Not all types of food grade products are suitable for automatic use in wholesome water applications.

NOTE 2 The use of bowsers follows the same guidelines as tankers with regard to transportation of wholesome water. Bowsers that have been utilized for waste water or dust suppression are also unsuitable for the carriage of wholesome water.

9.3 Pillow tanks

Pillow tanks with internal water contact surfaces of butyl rubber or polyvinyl chloride (PVC) should not be used, for reasons of taint, odour and chemical release into the water being stored. Any pillow tanks used should be manufactured from approved materials (see **9.1.3**, Note). Such tanks are usually made from polyurethane with an inner coating film. The welding should be "double weld" type. Taped welds should not be used as they increase the risk of trapping contamination and are difficult to disinfect between uses. The thickness (gauge) of the material used should be suitable for the designed capacity, e.g. a 250 000 L tank is of a much thicker gauge than a 25 000 L tank.

9.4 Cleaning of vessels and temporary networks

9.4.1 Selection, cleaning and maintenance of vessels

9.4.1.1 Any system for cleaning and disinfecting tankers/vessels/networks should be supported by robust procedures that are regularly reviewed and updated.

9.4.1.2 Vehicles, equipment and fittings used in water supply operations should not be used for any other purpose and be kept clean internally and externally.

9.4.1.3 If others tankers/vessels are used, they should:

a) be constructed of material that does not easily allow microbiological growth;

b) be able to withstand disinfection using 50 mg/L free chlorine;

c) be able to be completely drained; and

d) be accessible for the purposes of internal examination and disinfection.

9.4.1.4 All hatches should be close-fitting and capable of being locked.

9.4.1.5 All tankers and vessels should be drained when not in use (unless being used on a continuous basis) and appropriately cleaned prior to use.

9.4.2 Mechanical cleaning of vessels

9.4.2.1 If, after cleaning in accordance with **9.4.1**, the inner surface is not a uniform presentation of the original finished appearance, the vessel should be set aside for repair or further evaluation and cleaning before use.

9.4.2.2 The process of mechanical cleaning should be sufficiently vigorous to dislodge adherent contamination, while avoiding abrasion of the vessel surface. Mechanical cleaning of vessels should only be carried out using wholesome water, preferably with a pressure washer.

9.4.2.3 If a vessel is particularly dirty, it should be subjected to more intensive cleaning (to remove, for example, mild algal fouling), such as cleaning by hand with a sponge using a maximum chlorine solution of 20 mg/L.

NOTE Attention is drawn to the Confined Spaces Regulations 1997 [31].

9.4.2.4 The vessel should be filled with wholesome water, whilst at the same time being checked for leakages. If leakages are found, the vessel should be emptied, repaired, cleaned, disinfected and refilled.

9.4.3 Steam cleaning of vessels

*COMMENTARY ON **9.4.3***

It has been shown that steam cleaning stainless steel and other metal vessels or unglazed ceramic vessels can result in hard baking on of organic matter and bacteria to the surface of the tank and this can subsequently break down in contact with water, causing contamination.

9.4.3.1 If using steam on metal surfaces, the vessel should be flushed with cold water before steam cleaning.

9.4.3.2 Steam cleaning should not be used for polyethylene and polyurethane vessels as it tends to damage the surface in contact with the water, making the surface rough and thus susceptible to biofilm colonization. Steam cleaning should not be used for medium-density polyethylene (MDPE) as it damages the internal surfaces of vessels and renders them more difficult to clean and provide somewhere for biofilm to grow.

*NOTE Chlorine dioxide (ClO_2) is an effective way of stripping biofilm and other matter from the inside of vessels, i.e. a cold wash followed by ClO_2 (see **10.2.1**) without the need for using steam cleaning.*

9.4.4 Tanker cleaning, disinfection and preparation for deployment

*COMMENTARY ON **9.4.4***

The use of public (vehicle) cleaning stations for cleaning tankers that transport wholesome drinking water is neither recommended nor discouraged in this standard, but the tanker/haulage company is responsible for preventing contamination of any wholesome drinking water supplied.

9.4.4.1 The use of public (vehicle) cleaning stations should be accompanied by regular inspection and audits to ensure that good practice is maintained and records of any inspections/audits are kept by the tanker/haulage company for future reference/investigation (see Clause **11**).

9.4.4.2 All vehicle cleaning operations/activities should take account of the guidance in *Pollution Prevention Guidelines* PPG 13 [32].

9.4.4.3 The following generic procedure should be used when developing robust procedures.

a) Select the vessel for cleaning and record the type and unique identifying number (i.e. fleet or tank number) on the required documentation.

b) Check the vessel for physical damage and to determine internal and external cleanliness. Log any maintenance required in the vessel maintenance log. Carry out any maintenance and also record this in the maintenance log.

c) Clean/steam clean the outside of the vessel, preferably using a pressure washer, paying particular attention to side carriage lockers and rear couplings.

d) Flush the vessel with a supply of treated (wholesome) cold water.

e) Do not use detergents on non-metallic material as, over time, these could permeate non-metallic material and contaminate the water to be stored.

f) Check the exterior of high-density polyethylene (HDPE) and MDPE vessels for any oil spots.

g) Check the on-board pump(s), clean the bag/cap and tag the inlet and outlet apertures using new food grade bag/cap and tamper-evident seal.

h) Clean, bag/cap and tag all onboard couplings (fittings) and standpipes using food grade bags/caps and cable ties, if applicable. Ensure all couplings are sprayed to excess with 1 000 mg/L hypochlorite solution (freshly made that day).

i) Inspect all hoses:

   1) unroll each hose;

   2) insert an effervescent instant chlorine tablet (see Annex E) before coupling to the standpipe;

   3) flush the hose through;

   4) clean, bag/cap and tamper-evident seal the female coupling;

   5) roll up the hose; and

   6) repeat 1) to 5), bag/cap and tamper-evident seal the male coupling end.

j) Check tamper-evident seals are intact on all access hatches.

k) Complete all documentation and carry out any communication required locally.

9.4.4.4 Water vessels should not be sited near diesel generators and heavy plant using hydraulic oil, etc. Where risk assessment has identified a high risk of contamination, appropriate control measures should be implemented to prevent contamination. The presence of oil should be recorded in the vessel log and the vessel discarded.

NOTE 1 Where necessary, food grade/vegetable-based oils and hydraulic fluids can be used on tankers, pumps and discharge equipment due to potential risks of spillages and subsequent contamination.

NOTE 2 A list of hazards potentially arising at temporary events is given in Table 1.

9.4.5 Colour-coding scheme for disinfection

9.4.5.1 The following colour-coding scheme should be used to mark vessels and equipment according to their stages of preparation and readiness.

a) Black, signifying dirty/unprepared.

b) Red, signifying disinfection in progress.

c) Yellow, signifying a vessel is flushed and a sample taken for analysis.

d) Green, signifying prepared, ready for use/deployment.

NOTE Typically, only the green tamper tag is used for tankers and vessels in continuous use transporting wholesome drinking water. Not all operations can carry out immediate cyclic processes when cleaning vessels. The purpose of the colour coding is to establish that dirty tanks are not deployed and only those coded green can be deployed.

9.4.5.2 When an acceptable laboratory report is received, the tanker/vessel should be designated with a green identifier, signifying readiness for deployment.

9.4.5.3 A unique maintenance and disinfection record should be completed for each vessel and item of equipment in contact with wholesome water and the process should be signed off by trained personnel.

9.5 Use of temporary water supply vessels

9.5.1 Shelf life of prepared vessels

When vessels have been cleaned and disinfected in accordance with Clause **10**, they should be deployed in rotation according to use-by date to ensure that the oldest prepared vessels are deployed first. Vessels should be cleaned at the frequencies given in Table 2.

An auditing programme should be implemented to demonstrate adherence to a rotating cleaning scheme (see Clause **10**). Operators should not rely solely upon an audit, as standing water deteriorates when not being replenished with new water containing an acceptable concentration of residual chlorine (0.2 mg/L). For this reason the storage capacity should be proportionate to the estimated usage.

9.5.2 Boosting chlorine concentrations in standing vessels

9.5.2.1 Boosting of chlorine concentrations should not be performed if the source water contains chloramines (see Annex C).

9.5.2.2 If it is necessary to boost the level of chlorine, dosing should be applied such that a concentration of not greater than 2.0 mg/L of free chlorine is achieved.

9.5.2.3 If overdosing does occur then a small amount of water should be discharged and the vessel topped up with wholesome supply water to dilute the resulting concentration. The resulting concentration should be checked to ensure that it is between the desired limits prior to deployment of the water.

WARNING. Do not mix different types or brands of chlorine liberating media, such as tablets and liquids or powders. Use one method throughout.

Table 2A **Operational life for vessels between cleaning operations: Prepared WQ M DPE**

Transfer vessel		Static tank			
Deployment type	**Period of deployment (months)**	**Deployment type**	**Period of deployment (months)**	**Remaining empty in storage**	**Period (months)**
Regular daily usage with full contact with chlorinated water	2	Static tank replenished at least once every 6 days	6	Internal storage	6
		Upon uplift or drained for longer than 2 days	0	External storage	3

Table 2B **Operational life for vessels between cleaning operations: Prepared polyurethane (pillow tank)**

Transfer vessel		Static tank			
Deployment type	**Period of deployment (months)**	**Deployment type**	**Period of deployment (months)**	**Remaining empty in storage**	**Period (months)**
Regular daily usage with full contact with chlorinated water, e.g. temporary tanker, flatbed truck	1	Static tank replenished at least once every 6 days	3	Internal storage	6
		Continuous flow throughput of chlorinated water (replacing volume every 48 h)	6	External storage	2

Table 2C **Operational life for vessels between cleaning operations: Prepared grade 316 stainless steel**

Transfer vessel		Static tank			
Deployment type	**Period of deployment (months)**	**Deployment type**	**Period of deployment (months)**	**Remaining empty in storage**	**Period (months)**
Road tanker	3	Static tank replenished at least once every 6 days	12	Internal storage	6
		Continuous throughput with chlorinated water (replacing the storage volume every 48 h)	12	External storage	3

9.5.3 Replenishment of standing vessels

When replenishing a vessel the following procedure should be followed to maintain the integrity of the container and the supply being delivered.

a) Chlorinated supply water should make full contact with the internal surfaces of the standing vessel at each replenishment.

b) Water should be stored for a maximum of 7 days, and then only as long as a chlorine residual of not less than 0.2 mg/L can be maintained.

NOTE 1 It is expected that the water in the deployed vessel will be used within 4 days provided the vessel is appropriately sized.

c) The size of the tank required for a given water supply depends on its intended use and the population served. No vessel should remain in continuous use for longer than 12 months from deployment without being taken out of use for cleaning in accordance with Clause **10** and Table 4.

Bowsers and tankers used for intermediate transfer of water to temporary supply locations should be cleaned in accordance with the Clause **10** and Table 4 every three months.

NOTE 2 Stored water deteriorates over time when it is not being drawn off for use and replenished with new water with a required concentration of residual chlorine. For this reason the storage capacity has to be proportionate to the estimated usage (see Table B.2).

d) The appropriate measures should be taken to control the risks, including separation, bunding and barrier pipes. Any connections or joints between the barrier pipes should be made in accordance with the manufacturers installation instructions/requirements.

The chosen location should, where possible, allow sufficient access to facilitate replacement/replenishment without hindrance.

NOTE 3 To achieve this, it might be necessary to specify a separate access point for construction site compounds, and for public events this will be designated as part of the local authority licensing arrangements.

e) Quality control/assurance of deployed vessels. External factors, such as ambient temperature and the likelihood of extraneous material accidently entering storage vessels should be considered. The quality assurance procedures and documented disinfection logs should not therefore be relied upon to provide a guarantee of water quality for long-term (greater than 48 h) deployment of a supply without replenishment.

Each storage vessel should be sampled after 24 h in use and not deployed longer than 7 days.

9.5.4 Cleaning for reuse of pipework and fittings for use in the installation of temporary networks

NOTE By the nature of temporary networks the salvage and reuse of pipework and fittings is more commonplace.

Pipework and fittings should be cleaned and disinfected as follows prior to their reuse.

a) Salvage: upon disassembly separate damaged pipework and fittings, and discard/dispose of and/or recycle responsibly all damaged stock.

b) Fittings: place stock for reclaim in a clean container and wash, cleaning all traces of mechanically mobile material (e.g. grit and loose biofilm) before being placed in a chlorine soak (see **10.2**).

c) Flush the fittings with wholesome water and place in food grade bags for storage, bagged and tagged with the date and cleaning identifier [coded green ready for deployment; see **9.4.5.1**d)].

d) Wash pipework on the external surfaces and flush internally. Disinfect the pipework in accordance with Clause **10**.

e) During installation take care in maintaining the cleanliness of all pipework and fittings.

9.5.5 Evidence of hygiene certification

9.5.5.1 Hygiene certification should be recorded on tanker/bowser log sheets as evidence of due diligence.

NOTE An example of a drinking water tanker/bowser driver checklist is provided in Annex F.

9.5.5.2 A checklist should be completed by all tanker drivers/operators working on drinking water tankering operations, to ensure that tankers/vessels and associated equipment are fit for purpose before they are deployed and to provide a record of cleaning and maintenance.

9.5.5.3 The checklist should be signed by the driver/operator and should accompany any completed log sheets for the job. Any faults found with the tanker/vessel or associated equipment should be immediately notified to the responsible person.

9.5.5.4 Regular routine checks of hygiene certification should be recorded on the tanker log sheets.

a) **Fitting tamper-evident seals:** Once a tanker/vessel has been cleaned and disinfected (inlets, outlets, access lids, fittings, hoses, standpipes and couplings), bagging and tagging should be conducted using individually numbered tamper-evident seals. The tamper-evident seal numbers should be recorded on the tanker log sheets.

b) **Tanker filling:** At the tanker fill point, all tamper-evident seals should be examined (especially if the tanker has been left unattended during transit). Any seals that are broken or missing should be reported to the responsible person and appropriate action should be taken, i.e. re-cleaning/disinfecting or replacing the tanker.

   The tamper-evident seals that are associated with enabling loading of the tanker should be removed to allow the tanker to be filled. Once filled, the inlets should be re-sealed with new numbered tamper-evident seals. The new seal numbers should be recorded on the tanker log sheet.

c) **Tanker delivery (Discharge):** On arrival at the delivery point, all the tanker/vessel tamper-evident seals should be examined (especially if the

tanker has been left unattended during transit). Any seals that are broken or missing should be reported. If there is evidence of any malpractice, the relevant authorities should be notified. The tanker should be immediately quarantined and none of the contents should be delivered/discharged until a sample has been taken and approved for use. After sample analysis, if there is any doubt whatsoever about the integrity of the water quality or uncertainty about whether the tanker has been tampered with, the water should be disposed of in an appropriate manner and the tanker returned for cleaning and disinfection.

9.5.5.5 If, after initial inspection, all seals are shown to be intact, all delivery/discharge associated tamper-evident seals may be removed. When discharge has been completed the necessary outlets should be resealed with new numbered tamper tag seals. The new seal numbers should be recorded on the tanker log sheet.

9.5.5.6 If the same tanker is to be used for continuous multiple deliveries, steps b) and c) in **9.5.5.4** should be repeated until all deliveries are completed.

9.5.5.7 All records of seals should be recorded with tanker cleaning certificate or tanker log sheet.

9.5.5.8 The tanker driver/operator should have a hazard analysis and critical control points (HACCP) for steps a) to c) and have a procedure in place in the event of malpractice or other suspicious activity. All employees should be made aware of this procedure upon commencement of their employment and a record kept of their training for audit purposes.

NOTE 1 Tanker/drivers/operators may consider the use of satellite tracking on their vehicles for added vehicle security and to show due diligence.

NOTE 2 See Water UK/RSPH (Royal Society for Public Health) Principles of Water Supply Hygiene [33].

10 Disinfection

10.1 Disinfection techniques

WARNING. The use of chemicals can be dangerous, as can working in wet, slippery conditions or in enclosed spaces. This is to be carried out only by competent personnel.

10.1.1 Health and safety issues arising from the use of chlorine solution

10.1.1.1 The following procedure should be followed during disinfection with chlorine solutions.

a) Wear safety glasses or goggles and gloves, as appropriate. Handle with care to avoid splashes and leakage.

b) Refer to and be aware of any material handling data sheets, COSHH information sheets and any local (job specific) health and safety requirements.

c) If splashed into eyes, wash out immediately with copious amounts of clean, wholesome water or eyewash and seek medical advice.

d) If splashed onto skin, wash off thoroughly under running water and seek medical advice.

e) If splashed onto clothing, furnishings or other equipment, wash off immediately with clean, wholesome water.

f) Always ensure that everyone else (especially children and animals) are kept at a safe distance.

10.1.1.2 Where a health and safety risk assessment is carried out in accordance with statutory requirements for personnel undertaking any industrial/commercial process, the outcome should not result in the avoidance of the use of the recommended type and concentrations of disinfectants.

10.1.2 Step disinfection of vessels

10.1.2.1 The following procedure should be followed for filling and adding disinfectant to vessels requiring preparative cleaning once all traces of mechanically mobile material (e.g. grit and loose biofilm) have been cleared.

a) Calculate the dose of sodium hypochlorite (NaOCl) or calcium hypochlorite [$Ca(OCl)_2$]. Make up the solution to provide the nominated 50 mg/L free chlorine (see Table 3).

NOTE If the solution is made up in advance, check that the solution still comprises 50 mg/L.

b) Add the dose to the container identified with a black marker [see **9.4.5.1**a)].

c) Ensure that all internal surfaces are in contact with dosed water and the water is overflowing.

d) Sample the water in the container and measure the concentration of free chlorine achieved.

e) Calculate the required contact period in accordance with Table 3.

f) Identify disinfection status with a red marker [see **9.4.5.1**b)] and allow the water to stand for the required contact period.

g) Take another sample of water and measure the free chlorine to determine neutralization requirements prior to discharge to the environment and whether excessive chlorine demand has occurred.

h) Transfer the water to a separate neutralizing tank.

i) Fill and flush the container with wholesome water to ensure that all internal surfaces are contacted and the measured free chlorine concentrations are equal to the source wholesome water concentration or between 0.3 mg/L and 2.0 mg/L. Leave the flushing water in contact with all internal surfaces for 1 h before taking a microbiological sample.

j) Take a microbiological sample.

k) Drain the subject container completely.

l) Identify the subject container with a yellow marker [see **9.4.5.1**c)] and seal entry points and the outlets.

m) Await microbiological results.

n) In the case of unsatisfactory results, return to step c) and follow the process until acceptable results are achieved.

o) If satisfactory results are obtained, mark the subject container with a green marker [see **9.4.5.1**d)].

p) Move the subject container to a designated storage area.

10.1.2.2 If, after repeated attempts to clean a container or vessel, including replacing lids or seals, satisfactory microbiological results are not obtained, the container or vessel should be withdrawn from use for wholesome water storage or transportation.

Table 3 Look-up table for desired free chlorine, from NaOCl or $Ca(OCl)_2$

Desired free chlorine mg/L	Amount of NaOCl solution per 1 000 L for a range of solution percentage chlorine concentrations mL						Amount of $Ca(OCl)_2$ per 1 000 L g	
	3%	5%	6%	12%	15%	30%	25%	65%
5	170	100	90	50	40	20	20	8
10	340	200	170	90	70	40	40	16
15	500	300	250	130	100	50	60	24
20	670	400	340	170	140	70	80	31
25	840	500	420	210	170	90	100	39
30	1 000	600	500	250	200	100	120	47
40	1 340	800	670	340	270	140	160	62
50	1 670	1 000	840	420	340	170	200	77

10.1.3 Free chlorine soaking

A regularly-used contact disinfectant is wholesome water containing up to 50 mg/L of free chlorine for the appropriate time given in Table 4 (see Figure G.1 and Figure G.2).

NOTE Table 4 was constructed using data from the equation: contact period (h) = 300/free chorine (mg/L).

10.1.4 Chlorine dioxide

10.1.4.1 Once vessels have been mechanically cleaned internally and externally, they should be disinfected by all of the inner surfaces coming into contact with wholesome cold water containing not less than 1.5 mg/L and not more than 2.0 mg/L chlorine dioxide (ClO_2) for not less than 2 h.

NOTE For practical reasons, this is unlikely to be more than 4 h. Chlorine dioxide is thought to be particularly effective in situations where biofilm removal is the objective.

10.1.4.2 When disinfecting a pillow tank chlorine dioxide solution should be introduced into the vessel to ensure coverage of both top and bottom of the tank, while ensuring contact of the sides and agitating the surfaces by moving the solution inside the tank.

10.1.5 Chlorine solution spraying

Another method of disinfection is to spray high-strength chlorine solution (1 000 mg/L) on the internal surfaces and allow the vessel to stand for up to 16 h before flushing. This method should generally be reserved for small fittings, tools and ends of pipes, rather than vessels where it might not be possible to achieve effective contact with all internal surfaces during the operation.

Table 4 **Chlorine contact period**

1 **Initial free chlorine concentration** mg/L	2 **Contact period** h:min	3 **Minimum residual free chlorine measured at the end of the contact period** mg/L
3.1	16:00 [A)]	1.9
5	10:00	3
10	05:00	6
15	03:20	9
20	02:30	12
25	02:00	15
30	01:40	18
40	01:15	24
50	01:00	30

[A)] Contact periods of greater than 16 h are impractical under most circumstances when vessels are required for use. This equates to a minimum practical residual free chlorine concentration of 1.9 mg/L.

NOTE 1 The contact period commences when the entire volume, up to overflow concentration, is full of disinfectant solution at the required initial concentration.

NOTE 2 If the residual free chlorine measured at the end of the contact period is less than the values in this table, this indicates an excessive chlorine demand and poor prior cleaning. If this is the case the disinfection process needs to be repeated. The loss of free chlorine ought not to exceed 40% after the allotted contact period.

NOTE 3 Care is necessary to avoid exceeding 50 mg/L chlorine concentration to avoid corrosion risks to any copper included in fittings.

10.1.6 Alternative disinfectants

Alternative disinfection materials approved in the UK for use in contact with wholesome drinking water can be found in *List of approved products for use in Public Water Supply in the United Kingdom* [30]. This is periodically revised and should be referred to on any occasion when alternative disinfection materials are being considered. Generally, approval is only given to the chemicals used (typically hydrogen peroxide). Separate control systems on the actual process, certification and training should be employed when operating such a system.

10.1.7 Disinfection of temporary networks

Temporary networks should be cleaned and disinfected while ensuring that the risk of back-siphonage is minimized.

NOTE Compliance with BS EN 806-4 ensures compliance of system design with this recommendation.

10.1.8 Disinfection of plant

For plant items that come into contact with wholesome water and are disinfected in accordance with the recommended scheme (for example, standpipes), it is not practical or necessary to carry out microbiological tests (see **10.1.2**). For such items the colour coding scheme should be supported by a regular audit of operator practice and cross-checked against the training and medical/hygiene (EUSR: see Annex A) record of the individuals concerned. Only trained individuals should carry out the required tasks and sign off the process as complete.

*NOTE Under these circumstances the yellow tagging step in the scheme (see **9.4.5.1**) may be avoided and the cleaned vessel marked as green with an indicator that the process for that vessel has been recorded in the disinfection log.*

10.1.9 Disinfection of hand tools

Hand tools should be regularly disinfected, with 1 000 mg/L chlorine spray (see Annex E for guidance on the preparation and use of this chlorine solution) applied to cutting tools and general hand grips. Other locally accepted practices may be in operation using proprietary wipes or solutions. The tools should be left for two 2 min before being rinsed thoroughly. Hand tools should be steam or hot washed once per week or where there is a heightened risk of cross-contamination, and this should be recorded. Tools that have been used in areas of gross contamination, e.g. wastewater/sewage applications, should not be used.

10.2 Larger vessels: Grade 316 stainless steel vessels, MDPE pipes, fittings and vessels of a volume greater than 500 L

10.2.1 Chlorine dioxide

*COMMENTARY ON **10.2.1***

For larger systems and bulk drinking water vessels, chlorine dioxide (ClO2) is recommended although other disinfectants (chlorine) may be used for disinfection.

10.2.1.1 Dosing of the contact water to concentrations not greater than 2.0 mg/L (ClO_2) can be achieved by mixing two chemicals (a precursor sodium chlorite and an acid) to produce a gas, which is injected into the water. The process should be carried out with specialist equipment operated by a person who has received specialist training (from, for example, the chlorine generator manufacturer or producers of preparatory products, as indicted by the risk assessment) that covers emergency spill procedures.

NOTE 1 Alternatively, ClO2 can be delivered directly in solution by the application of preparatory products which are available in powder, sachets and tablet form.

NOTE 2 See BS EN 12671 for specification of chlorine dioxide generated in situ.

10.2.1.2 When using ClO_2 unnecessary exposure of the water to light should be avoided since degradation of the dissolved gas can be accelerated at the water surface by UV light. For this reason all containers should be covered with light-excluding materials.

NOTE BS EN 12671 makes reference to other materials which might be suitable for disinfection with chlorine dioxide solutions.

10.2.2 Calcium hypochlorite

NOTE Calcium hypochlorite may be used to disinfect stainless steel. Sodium hypochlorite may also be used (see BS EN 938), but under short contact periods calcium hypochlorite and sodium hypochlorite are considered to be less effective at removing biofilm.

The contact period required to remove a biofilm with different disinfection agents should be determined by experiment, taking account of other sources of contamination such as valves seats and other potentially poorly accessible parts of a container.

10.2.3 Flushing of vessels

10.2.3.1 Sampling programmes/intervals should be agreed in advance of any operational activities and should be appropriate in terms of number of samples and sampling points, in relation to the temporary supply being provided.

10.2.3.2 Once the desired contact period has been achieved, vessels should be flushed to ensure residual chlorine concentrations in the effluent are equal to the wholesome supply, or are between 0.3 mg/L and 2.0 mg/L of chlorine.

10.2.3.3 Any waste flushing water should be de-chlorinated with due regard to the environment.

NOTE It is usually necessary to advise relevant statutory bodies in advance of any discharge and obtain approval from them.

10.2.3.4 Only when the residual chlorine concentration (see **10.2.3.2**) has been achieved and recorded should a microbiological sample be taken from the tanker/vessel discharge point in accordance with BS 8550 and sent to a laboratory approved to carry out drinking water testing for the purpose of determining wholesomeness under the relevant water quality regulations.

NOTE 1 See BS ISO 5667-21 and BS EN 19458.

NOTE 2 The DWI provides a list of accredited laboratories deemed competent [5]. It is advisable to use a laboratory used by the local water company or local authority for regulatory testing so that the results will be recognized.

10.2.3.5 Following sampling (see Clause **11**), the vessel should be emptied and all potential entry points closed, sprayed with 1 000 mg/L chlorine solution and sealed with a clean, unused bag or shrink wrap, or taped in a tamper-evident manner to prevent/discourage unauthorized access (or access by insects and vermin).

*NOTE See **9.4.5.1** for colour-coding for disinfection of vessels.*

10.2.4 Disposal of disinfection contact water (washings)

Washings should be treated according to two concentrations of chlorine.

a) Low concentration, up to 2.0 mg/L chlorine: dispose to ground or to surface/foul drain with Environment Agency or other relevant authority consent.

b) Super chlorinated, >2.0 mg/L chlorine: reduce chlorine concentration to less than 2.0 mg/L chlorine, dispose to ground or to surface/foul drain with Environment Agency or other relevant authority consent.

Chlorinated water should not under any circumstances be discharged directly into a controlled water or any ditch or drain that could drain into controlled water.

10.2.5 Chlorine reduction prior to discharge using granular sodium thiosulfate

10.2.5.1 Containers used to store sodium thiosulfate should be clearly labelled and kept in a dry atmosphere, out of direct light and away from sources of heat.

NOTE Heavily chlorinated water is toxic to aquatic life, but sodium thiosulfate can be used to de-chlorinate the solution before discharge.

[5] http://dwi.defra.gov.uk/private-water-supply/RHmenu/laboratories.html [viewed: 14 September 2015].

10.2.5.2 The required weight of granular sodium thiosulfate in grams should either be calculated using equation 1 or selected from Table 5.

$$18 \times (V/1\,000) \times (C/5) \quad (1)$$

where:

V is the volume of water to be de-chlorinated in litres (L); and

C is the concentration of free chlorine in milligrams per litre (mg/L).

NOTE This formula is based on the assumption that 18 g of sodium thiosulfate will remove 5 mg/L of free chlorine in 1 m³ (1 000 L) of water, but the equation can be used to calculate quantities of sodium thiosulfate needed to neutralize other volumes of water and concentrations of free chlorine.

Table 5 **Weight of granular sodium thiosulfate (g) required to neutralize free chlorine concentrations**

Volume of water	**Free chlorine concentration measured in volume of water** mg/L								
	5	10	15	20	25	30	40	50	55
250 L	5	9	14	18	23	27	36	45	50
500 L	9	18	27	36	45	54	72	90	99
750 L	14	27	41	54	68	81	108	135	149
1 000 L	18	36	54	72	90	108	144	180	198
1 500 L	27	54	81	108	135	162	216	270	297
2 000 L	36	72	108	144	180	216	288	360	396
3 000 L	54	108	162	216	270	324	432	540	594
4 000 L	72	144	216	288	360	432	576	720	792
5 000 L	90	180	270	360	450	540	720	900	990
7 500 L	135	270	405	540	675	810	1 100	1 400	1 500
10 m³	180	360	540	720	900	1 100	1 500	1 800	2 000
15 m³	270	540	810	1 100	1 400	1 700	2 200	2 700	3 000
20 m³	360	720	1 100	1 500	1 800	2 200	2 900	3 600	4 000
25 m³	450	900	1 400	1 800	2 300	2 700	3 600	4 500	5 000
30 m³	540	1 100	1 700	2 200	2 700	3 300	4 400	5 400	6 000

10.2.5.3 For every additional 5 m³ capacity, an additional 90 g of thiosulfate should be added.

10.2.5.4 Quantities of sodium thiosulfate should be weighed out using scales accurate to 5 g. The thiosulfate should be dissolved in 1 L to 5 L of wholesome water (containing free chlorine concentrations lower than 1.00 mg/L) and then added to the volume of water being de-chlorinated.

NOTE More effective, rapid neutralization of the free chlorine present will occur when the concentrated thiosulfate solution and the water being treated are thoroughly mixed, e.g. by physically agitating the volume of water with a clean implement or by circulating the water by other means. Dissolving the sodium thiosulfate prior to dosing ensures that it is more effectively mixed.

10.2.5.5 In the interest of efficiency, the de-chlorinated water should be used to wash the external surfaces of vessels, pumps, hoses and associated vehicular transportation equipment that will not come into direct contact with wholesome water.

10.2.5.6 Discharge should only take place if measurements indicate that the water contains less than 0.30 mg/L of free chlorine. Discharge to a public sewer or the environment should not be conducted without a consent to discharge from the relevant authority.

11 Monitoring and sampling of temporary water supplies

11.1 General

*COMMENTARY ON **11.1***

During and after installation of a temporary supply it is important that the water supply remains wholesome in order to prevent risk to public health.

11.1.1 Installation, alterations or modifications to any temporary drinking water supply should be made only by named and suitably qualified, competent personal, which may include representatives of the local authority or the water undertaker.

11.1.2 Monitoring and sampling to ensure the wholesomeness of the water supply should only be carried out by suitably qualified, competent personnel using appropriate equipment. Training should include the use of analytical equipment in line with manufacturer's instructions. Records of training and competency should be kept for audit purposes.

11.2 Monitoring: physical aspects

The following aspects of the water supply installation should be monitored and any issues reported:

a) check that any temporary pipework connections to hydrants/washouts are securely fenced off to prevent unauthorized access and that access is not obstructed by vehicles, etc.;

b) check for any unauthorized connections or fittings;

c) check whether union taps and hoses are connected to wholesome supplies;

d) ensure pipe runs are secured off the ground if in close proximity to generator and fuel store locations;

e) check any standpipes supplied as part of a temporary network are of the non-hose union type to resist the attachment of hoses;

f) ensure the water take-off points and the surrounding area are free of litter;

g) monitor for any water leaks, overflowing tanks or excessively wet areas;

h) ensure foul water discharge points are fenced off from public access and restricted to competent personnel;

i) ensure any water supplied from a tanker is not connected to the mains water system, unless separated by a suitable fluid category 5 air gap;

j) ensure tankers are only permitted to refill from predetermined water systems, fire hydrants or wash-out points, as agreed with the water supplier;

k) check tags on all connections to ensure they were disinfected before being installed;

l) ensure any fuel spill is reported immediately to the responsible person;

m) ensure backflow protection to fittings has not been compromised;

n) check integrity of pipe insulation (if installed);

o) check above ground pipework has not been compromised by on-site activity such as vehicular movement; and

p) check drinking water points are visibly clean and free from visible contamination.

11.3 Monitoring: on-site testing

11.3.1 To ensure that the water supply remains wholesome during transport, storage and delivery on-site monitoring should be carried out, using the following checks as appropriate.

NOTE 1 This applies to water being used to fill tankers or storage vessels, water being supplied from tankers or storage vessels, and water being supplied from a temporary network.

a) Free and total chlorine concentration should be carried out on site using appropriate equipment. Details of the sample location, date and time, and the results in mg/L should be recorded on the appropriate paperwork.

b) Appearance checks should be carried out to ensure that the water is clear and bright, perhaps by observing the sample in a clear sample bottle or taste and odour jar. The date, time and description of the appearance should be recorded on the appropriate paperwork. Any discolouration or particles observed in the sample should be reported to the responsible person as soon as possible.

c) Any taste and odour checks carried out on site (see Note 2) should use a clean glass testing jar that is reserved for taste and odour analysis of drinking water only. The date, time and description of any taste or odour should be recorded on the appropriate paperwork. Any unusual or unpleasant taste or odour should be reported to the responsible person as soon as possible.

NOTE 2 Taste and odour checks can only be carried out when microbiological tests have been undertaken and passed. If there is any doubt in respect of the appearance or odour, do not taste.

d) Temperature may be monitored at a frequency based on risk (exposure of the tank, ambient temperatures, season, etc.) and action should be taken if the temperature exceeds 25 °C, for example covering the tank or insulating the pipework.

11.3.2 If water is to be stored or supplied for greater than 24 h, this on-site testing should be carried out at least daily from the relevant sampling points as identified on site schematics and in the risk assessment for the site.

11.3.3 Chlorine concentrations should be measured using a device calibrated in accordance with the manufacturer's instructions, such as a colour comparison device or a photometer or probe. The device used should be capable of measuring ranges typically from a minimum 0.02 mg/L to a maximum 10 mg/L and 10 mg/L to 70 mg/L.

NOTE 1 Individual instrument measurement ranges can vary between manufacturers.

NOTE 2 BS 1427 gives useful information on the selection and use of test kits and equipment for use outside of a laboratory. Chlorine concentrations above 70 mg/L can be determined by dilution and subsequent calculation, but such methods might not be practical in the field.

11.4 Sampling

*COMMENTARY ON **11.4***

*Along with the monitoring activities described in **11.3**, taking samples for analysis at a laboratory is essential in confirming the wholesomeness of the water being supplied.*

11.4.1 Samples should be taken where anomalies in monitoring indicate that the water quality is unsustainable for 48 h; and to demonstrate whether any remedial action, such as draining, replenishing or boosting chlorine levels within acceptable guidelines, has been effective [see a) to e)].

a) **Sampling of water used to fill tankers or storage vessels**

- Water used for filling tankers and storage vessels should be drawn from the public water supply or a private supply network that meets the wholesomeness standards so that no further sampling is required. Residual chlorine, taste and odour and appearance checks should be carried out in accordance with **11.3.1**a) to c).

b) **Sampling following cleaning and disinfection of tankers or storage vessels**

- Following cleaning, disinfection and flushing of a tankers or storage vessel a sample should be taken to verify the effectiveness of the process. The sample should be taken for Coliform and *E. coli.* Consideration should also be given to analysing for colony counts at 22 °C, colony counts at 37 °C, turbidity, pH and conductivity.
- Residual chlorine, taste and odour and appearance checks should be carried out in accordance with **11.3.1**a) to c).

c) Sampling of water supplied from transfer or storage vessels

- Residual chlorine, taste and odour and appearance checks should be carried out on the outlet of storage vessels in accordance with **11.3.1**a) to c). If the results of these checks indicate a deterioration in water quality, the contingency arrangements set out in the WSP should be implemented.
- Water should be stored for not longer than 7 days (see **9.5.3**).

d) Sampling and monitoring following installation of temporary supply network

- Following installation and disinfection of a temporary network, samples should be taken to ensure the wholesomeness of water supplied. The sample should be taken for Coliforms and *E coli. C*onsideration should also be given to analysing for Colony Counts at 22 °C, Colony Counts at 37 °C, turbidity, pH and conductivity. Residual chlorine, taste and odour and appearance checks should be carried out in accordance with **11.3.1**a) to c).
- The number of samples required depends on the size of the temporary network and should be identified on the site plans and risk assessment. Samples should be taken from outlets to ensure that all legs/branches of the network are covered.

e) Ongoing sampling and monitoring of temporary supply network

- Residual chlorine, taste and odour and appearance checks should be carried out at least every 24 h in accordance with **11.3.1**a) to c) for the duration that water is being supplied.

11.4.2 Samples should be analysed at a laboratory accredited to carry out drinking water quality analysis.

NOTE The DWI provides a list of UKAS-accredited laboratories (http://dwi.defra.gov.uk/private-water-supply/RHmenu/laboratories.html) [viewed: 14 September 2015].

11.4.3 All samples should be taken in the appropriate bottles as prescribed by the analysing laboratory.

11.4.4 All bottles should be clearly labelled with the date and time of the sample and the sampling location. Samples should be accompanied by a completed sample submission sheet including contact details, as required by the analysing laboratory.

11.4.5 All samples should be stored and transported in a clean, cool, dark environment, ideally a fridge or cool box, and delivered to the laboratory as soon as possible but certainly within 24 h of sampling.

11.5 Actions to take following unsatisfactory sample results or monitoring data

11.5.1 Sample results should be made available before bringing the supply into use.

11.5.2 The result of the analysis should meet the standards in Table 6. In the event of unsatisfactory results the sample failure process given in the WSP should be followed.

Table 6 **Drinking water quality standards**

Parameter	Result	Unit of measurement
Escherichia coli (*E. coli*)	0	Number(cfu)/100 mL
Coliform bacteria	0	Number(cfu)/100 mL
Colony count 22 °C	[A)]	Number(cfu)/mL
Colony count 37 °C	[A)]	Number(cfu)/mL
Turbidity	4	NTU
Conductivity	2 500	µS/cm at 20 °C
pH	6.5 to 9.5	pH units

[A)] Colony count at 22 °C and at 37 °C may be used to check the ongoing microbiological water quality. There should be no significant increase in the numbers observed. In practical terms this can be compared to the results of first load delivered and/or data provided by the water provider, on the typical colony count at 22 °C and 37 °C of the water supply zone used for filling the tanker(s). Colony count values between 50 cfu/mL and 100 cfu/mL normally prompt intervention, such as "freshening up" the water or boosting the chlorine residuals, with some investigation as to the reason for the increase. Colony count values greater than 100 cfu/mL normally prompt the water to be dumped, and cleaning and disinfection of the vessels, but all values are relative to the supply being provided. It might be difficult to interpret colony count data over the short time periods encountered in temporary supplies. The key factor in the interpretation of colony count data is the element of "significant increase" as this could indicate the use of inappropriate materials or changes in the quality of the source water.

11.5.3 The conductivity of the water should be checked to ensure that:

a) there is no deviation greater than a 10% increase above that measured in the source water; and

b) there is no build-up of inorganic matter which would not otherwise show up on chlorine checks.

11.5.4 The pH of the water should be checked to ensure that the hydrogen ion concentration (pH) of the water is between 6.5 and 9.5.

11.5.5 Any results that fail to meet the standard in Table 6 should be highlighted immediately to the person responsible for the site. The affected infrastructure should be removed from service and appropriately marked. Liaison should then take place between the water undertaker and local authority, and Public Health England if appropriate, to decide the appropriate response to the unsatisfactory samples.

NOTE Action may include:

a) draining and refilling tankers or storage vessels;

b) draining and disinfecting tankers and storage vessels;

c) boosting chlorine residuals;

d) wider re-sampling and monitoring programme to confirm the extent of any contamination;

e) sampling of upstream supplying water is network is connected to public supply; or

f) flushing or disinfection of temporary network.

11.5.6 All actions should be followed up with bacteriological samples taken from the affected infrastructure. Satisfactory sample results should be achieved before bringing the system into use.

11.6 Corrective action following the rejection of water stored in temporary supply vessels at the point of consumption

The following control criteria should be applied to generate corrective action.

a) Any complaints of colour, cloudiness, taste or odour by customers should result in an investigation followed by the appropriate remedial action depending on the outcome.

   NOTE This may include immediate cleaning of the tank and replacement of service, unless the complaint can be attributed reliably to the level of residual chlorine in the water.

b) During replenishment of a supply, the following steps should be taken.

   1) Check the chlorine residuals of any water in the vessel.

   2) If the residuals are zero, drain and refill the vessel.

   3) Measure the chlorine concentration.

   4) If necessary, arrange another visit to check that chlorine concentration remains stable and is not decreasing.

c) If, during a routine monitoring visit, the chlorine residual has declined rapidly or is found to be less than 0.2 mg/L of the concentration in the water at the time of delivery of the load then the frequency of monitoring should be increased.

d) After three corrective actions have failed to maintain an adequate chlorine residual between loads the storage vessel should be replaced.

12 Bottled water for temporary supply

12.1 General

NOTE Production and storage of bottled water for use at a temporary event might be covered by the following regulations:

a) if produced and offered for free by a water company or water supply licensee the water is controlled by the Water Supply (Water Quality) Regulations [5], [6], [7] and [8];

b) if the source of the bottled water is a private supply, the water is controlled by the Private Water Supply Regulations [9], [10], [11] and [12]; and

c) if it is offered for sale or is packaged as natural mineral water, spring water or bottled drinking water, the water is controlled by the Natural Mineral Water, Spring Water and Bottled Drinking Water Regulations [16], [17], [18] and [19].

As part of the granting of a licence by the local authority the bottled water producer will put in place a sampling and monitoring process to demonstrate that, at the point of bottling, the water conformed to the Natural Mineral Water, Spring Water and Bottled Drinking Water Regulations [16], [17], [18] and [19].

12.1.1 For the purposes of monitoring bottled water purchased and stored for use as a temporary water supply, the unit of microbiological testing should be a batch of up to 26 pallets from the same source and day of production. The source, batch and date/time of production should be clearly displayed for the purpose of auditing. When bottled water is stored for fewer than 30 days from production, there is no need for long-term storage testing. The criteria in Table 7 should be applied at the time of production.

Table 7 **Prescribed concentrations and values**

Parameter	Maximum concentration or value	Unit of measurement
Escherichia coli (E. coli)	0	Number/250 mL
Enterococci	0	Number/250 mL
Pseudomonas aeruginosa	0	Number/250 mL
TVC counts at 22 °C	100	Number/mL
TVC counts at 37 °C	20	Number/mL

12.1.2 The total viable colony count (TVC) should be measured within 12 h of bottling, with the sample water being kept at the same temperature throughout that 12-hour period.

12.1.3 Any increase in the TVC count of the water between 12 h after bottling and the time of use should not be tolerated if it exceeds the following criteria.

a) As a guide, the counts measured at 22 °C and 37 °C should not increase between successive sampling occasions by more than 3 log orders of magnitude.

NOTE TVCs are a measure of background bacteria in a water source and it is common to detect numerous colonies. It is only of concern where these counts increase significantly between sampling occasions.

b) However, where the water is retained for longer-term storage prior to consumption as a buffer stock (up to 24 months post-bottling), the permitted concentration of TVC count should be less than 5 at both temperatures (37 °C and 22 °C) at the time of bottling.

12.1.4 Different observations might occur from differing production sources, and a single bottle from each batch should be tested each month.

12.2 Storage

12.2.1 Bottled water should be stored in a cool, dark place out of direct sunlight, with a sheet of plastic laid on top to exclude light and dust. The bottled water should be dispatched in order of the oldest date of production first.

12.2.2 Strong odours and volatile materials can permeate plastic packaging and cause an objectionable taste in the stored water. Storage environments such as the following should therefore be avoided:

a) proximity to freshly painted areas;

b) proximity to odorous materials of any kind, such as cleaning chemicals and fuel;

c) proximity to operational diesel forklifts;

d) proximity to use of pesticide sprays and insect proofers (e.g. moth-proofers);

e) proximity to heat sources;

f) direct sunlight from windows, roof lights and doors which are habitually left open during the working day; and

g) dirty, dusty environments in working warehouses which could leave the pallet dirty, making it aesthetically unacceptable.

12.2.3 The proximity should be determined by the findings of a risk assessment. Appropriate measures should be taken to prevent vermin access, and hands should be washed before bottles of water are handled, for example to move them to another location.

12.3 Criteria for rejection of stored bottled water

Water should be rejected from storage or use if one or all of the following criteria apply:

a) time in storage exceeds 24 months since bottling;

NOTE This criterion on its own does not mean that the water is not wholesome and needs to be rejected.

b) there is validated evidence of unacceptable taste and/or odour in the stored water;

c) the TVCs for one or both of the counts measured at 22 °C and 37 °C increase between successive sampling occasions by more than 3 log orders of magnitude; and

d) green algal or black or brown fungal growth has occurred on the packaging or the bottles, or the packaging is otherwise dirty.

12.4 Just-in-time delivery

*COMMENTARY ON **12.4***

In the event of just-in-time delivery of bottled water, certification of conformity with the Natural Mineral Water, Spring Water and Bottled Drinking Water Regulations [16], [17], [18] and [19] is regarded as a sufficient quality assurance record prior to distribution.

12.4.1 All bottled water used for temporary supply purposes should display a best before date, indicating the date by which the quality can be assured as at its best.

NOTE It is recommended that this is accompanied by a second date, which is intended to indicate the date before which the supplier advises the water is to be consumed. This indicates the date by which the product will have outlived its shelf life, and is intended to ensure that recipients will not unwittingly consume expired product. The best before date ought to be clearly visible.

12.4.2 If no best before date is displayed, the water should not be deployed, unless substantial data are available from monitoring to demonstrate conformity to the Natural Mineral Water, Spring Water and Bottled Drinking Water Regulations [16], [17], [18] and [19] at the time and point of deployment.

NOTE When water undertakers deploy bottled water in place of a public water supply provided by pipes then the bottled water is required to conform to the definition of wholesome water as set out in the Water Supply (Water Quality) Regulations [5], [6], [7] and [8]. Some bottled waters might not be suitable for these purposes due to their higher mineral content or due to insufficient data being available from the producers to demonstrate compliance.

Annex A (normative) Staff water quality awareness training

A.1 Temporary water supply providers should have a programme for training personnel that is periodically reviewed or updated, with at least the following four elements.

a) Basic operator training, sufficient to enable personnel to clean, assess and protect equipment, tools, clothing, vessels and pipework, to label vessels and equipment, and to have awareness of water hygiene guidelines.

NOTE 1 The UK water industry supports a scheme run by the Energy & Utility Skills organization, the Energy and Utility Skills Register (EUSR), to ensure there is a consistent mechanism for training, assessing and accrediting operators for work on restricted operations, i.e. sites with access to treated water. On successful completion, an operator is issued with a standard card, which is valid for three years, after which the training needs to be retaken. The EUSR training covers when to report certain illnesses to management and isolate themselves from contact with operational facilities and equipment.

b) Sampler training, sufficient for personnel to take microbiological and chemical samples, and make and record field chlorine measurements. Accreditation is offered by a number of organizations, but competence should be considered as a minimum level of training in following a robust sampling procedures manual, signed off by a suitably-trained and experienced member of staff, with regular refreshers and audits to ensure the procedures are being followed.

c) Network operations training, sufficient to enable personnel to operate hydrants or valves without compromising the supply main integrity or putting the drawn-off water quality at risk (typically from discolouration through disturbance of mains deposits, but also from contamination from the standpipe or swan neck), including record keeping.

d) Basic health awareness training to ensure that they do not present an increased risk of transmission of agents associated with waterborne illnesses.

NOTE 2 This usually takes the form of a preliminary health questionnaire accompanied by relevant information to identify risk factors that might warrant the individual being excluded from operational tasks until they have been assessed by a medical practitioner as being fit to work on restricted water supply operations.

A.2 In addition, for nominated personnel, process auditor training should be provided to facilitate an effective ongoing quality assurance monitoring programme.

Annex B (informative) Flow demands

Table B.1 **Flow demands**

DOMESTIC	**L**	
Standard residential	200	Per person/day
Mobile home (caravan type with full services)	180	Per person/day
INDUSTRIAL		
Office/Factory (without canteen)	50	Per person/day
Office/Factory (with canteen)	100	Per person/day
Open industrial site, e.g. construction, quarry, without canteen	60	Per person/day
HOTELS		
Holiday camp chalet	227	Per chalet/day
AMENITY		
Toilet blocks	10	Per person/visit
Shower per use	40	Per person/visit
Health club/Sports centre	50	Per person/visit
Tent only sites	70	Per person/day
Caravan sites (touring or static not serviced)	100	Per person/day
Caravan (static serviced)	180	Per person/day
Festival sites (day visitors) limited concessions (age range 16-30)	20	Per person/day
Festival sites (camping) concessions	35–50	Per person/day
RESIDENTIAL CARE HOMES		
Residential old people/nursing	350	Per person/day

Table B.2 **Choice of tank size relative to population served**

Number of people	Tank size or range	Replenishment cycle
	L	Days
1	500	7
2 to 4	500 to 1 000	7
5 to 10	1 000 to 5 000	5 to 7
11 to 30	5 000 to 10 000	5 to 7

Annex C (informative) Chloraminated water

Chloraminated water typically produces a very low chlorine concentration reading with N,N-diethyl-p-phenylenediamine (DPD), as the chlorine is chemically bound to ammonia and takes a considerable time to react, during which atmospheric oxidation can occur and affect the final result. This chemical bond can be broken and a reading can be obtained by the addition of potassium iodide, which is swiftly oxidized to iodine, which in turn reacts with DPD.

Typical proprietary procedures to measure free chlorine either specify the addition of a powder mix of DPD and buffer (commonly known as DPD No. 1) to the sample water or adding the sample water to a DPD No. 1 tablet which has been crushed in a few drops of sample water, followed by rapid mixing to dissolve and measuring the resultant pink colour without delay.

To measure chloramines as well as free chlorine, potassium iodide (commonly known as DPD No. 3) is added to the sample already containing DPD No. 1, mixed and allowed to stand for 2 min. The resulting pink colour is then measured and classified as total chlorine. The concentration of chloramines is calculated by subtracting the free chlorine from the total chlorine and, for convenience of calculation, is usually expressed as chlorine in units of mg/L.

If the free chlorine concentration is not of interest, both DPD No. 1 and DPD No. 3 (which are available in combined formulations, commonly known as DPD No. 4) are added in a powder mix to the sample water, or the sample water is added to tablets of DPD No. 1 and DPD No. 3 (or a DPD No. 4) crushed in a few drops of sample water, followed by rapid mixing to dissolve and standing for 2 min before the resultant pink colour is measured.

If other oxidizing biocides are present, specialist analytical techniques might be required. Information on the use of an alternative oxidizing biocide can only be obtained from the water utility or regulated private undertaker of wholesome water. The use of such alternative chlorine-based disinfection regimes is rare in the UK, but many private water supplies and some public water supplies are disinfected at source with UV or by other means and might not contain any residual chlorine.

Annex D (informative) Information required to manage the provision of a temporary water supply

D.1 Before supply of water

The steps in **D.2** to **D.5** are recommended as basic communication steps for ensuring that water of sufficient quality and quantity is supplied proportionate to the intended use and the number of customers.

D.2 Ascertain purpose

Determine the number of people to be served and for what purpose (see Table B.1), for example:

a) one-day event, such as a wedding;

b) weekend event, non-residential or residential;

c) camping or temporary structures versus permanent buildings;

d) drinking only, or washing, sanitary, showers and toilets; and

e) building site all-purpose supply.

D.3 Logistics

D.3.1 Access, safety, security/tamper proofing (see Clause **7**).

D.3.2 Advise the customer of a requirement to optimize a supply, to achieve a four-day turnaround/resupply to maintain the desired water quality.

D.3.3 Determine if storage out of direct sunlight is achievable and recommend alternative locations if possible.

D.4 Communication

D.4.1 Remind customers of responsibilities for water quality and hygiene. Temporary water supplies might constitute Regulation 8 supplies under the Private Water Supply Regulations [9] and [10] in England and Wales.

D.4.2 Provide information which allows users to access the DWI document *Drinking Water Safety: Guidance to health and water professionals* [34].

D.4.3 Provide a telephone number to call if questions arise or problems occur and the contact details of the relevant local authority.

D.4.4 Discuss/agree with the customer who is responsible for maintaining the integrity of the temporary supply protection from unauthorized access.

D.5 During supply

Advise the customer, where appropriate, of the system design, i.e. whether it supplies under gravity or by pumped pressure. Make a verified schematic of the supply system available, together with notice of any responsibility for maintenance the customer might have and the need to allow access for effective deployment of break tanks or double check valves, etc.

Also advise the customer that they ought:

a) not to connect any other fittings other than those supplied, or disconnect or alter fittings/pipes;

b) not to add anything to the tank;

c) to be vigilant for changes, such as the appearance of algae or strange taste, or evidence that tampering with the vessel or supply fittings has occurred;

d) not under any circumstances to connect the temporary supply vessel to a mains water supply or any other private water supply without ensuring a type AA or type AB air gap as described in the Water Fitting Regulations [13], [14] and [15]; and

e) not to drain the vessel without an appropriate consent to discharge it to the environment.

Annex E (informative) Guidelines for the preparation and use of chlorine and the use of chlorine disinfection solutions

E.1 Hypochlorite or chlorine (sodium or calcium) solutions are commonly used as an effective method of disinfecting equipment, clothing, water mains/pipes and fittings. Appropriate health and safety procedures need to be employed when using hypochlorite (or chlorine) solutions (see relevant Health and Safety guidance notes, risk assessments and COSHH data sheets as necessary). Even in low concentrations chlorinated/chloraminated water can kill fish and cause environmental pollution if discharged to watercourses. It is therefore essential to plan how best to dispose of chlorinated/chloraminated solutions to the environment.

a) Commercial cypochlorite (sodium) solution is a caustic solution containing between 10% and 15% available chlorine when new. For the disinfection of equipment, boots, waterproof clothing, gloves and the exposed surfaces of pipes, hosed, pumps, valves, fittings and couplings a diluted solution of 1 part commercial sodium hypochlorite solution (10%–15%) to 90 parts water should be used. This provides a 1 000 mg/L solution.

b) Effervescent chlorine tablets are rapidly dissolving and provide a simple and effective means of preparing chlorine solutions of known strength, for disinfection purposes approved for use with wholesome water. They are best used for making up small quantities of solution.

E.2 When using effervescent chlorine tablets it is necessary to consider the different size of tablet and the strength of solution that will be produced, and to refer to the manufacturer's instructions/guidance notes.

E.3 1 × 1 000 mg effervescent chlorine tablet dissolved in 1 L of clean water gives a 1 000 mg/L free chlorine solution.

E.4 All solutions made from tablets need to be used on the day of preparation, which is to be marked on the bottle. Disposal of small amounts of excess hypochlorite solution needs to be to sewer and flushed with copious amounts of clean water. These solutions cannot be allowed to enter watercourses or surface water drains.

E.5 The following are the key points to be followed when preparing and using chlorine disinfection solution for disinfection of pipes, fittings, couplings, hose ends and tools, using a 1 L spray bottle filled with 1 000 mg/L of chlorine disinfection solution.

a) **Containers and spray bottle**

It is recommended that only the types of storage containers and spray bottles shown in Figure E.1 are used. They need to carry the illustrated Hazchem warning labels.

Figure E.1 **Correct type of containers showing labelling required**

b) **Personal protective equipment (PPE)**

Figure E.2 and Figure E.3 illustrate the correct type of PPE to be worn when preparing and using chlorine (hypochlorite) disinfection solution.

Goggles, nitrile gloves and appropriate work-wear, i.e. coveralls work trousers and long sleeved top, are to be worn at all times when mixing and applying the chlorine disinfectant solution. At NO time is bare skin to be exposed to the chlorine disinfectant solution/spray.

This PPE is in addition to any other PPE specified in site rules or risk assessments.

Figure E.2 **Example of preparation of chlorine disinfection solution**

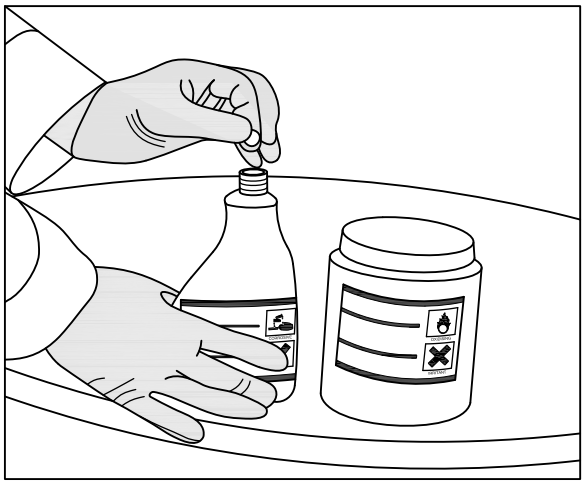
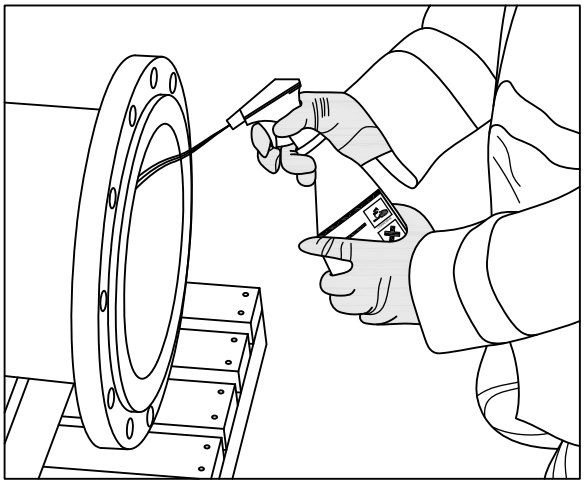


Figure E.3 **Example of the correct use of chlorine disinfection solution**



c) **Process**

1) Check the condition of the spray bottle; if it is not satisfactory, e.g. cracked/brittle/not sealing correctly, dispose of the spray bottle and obtain a new one. Ensure that the spray bottle has a clear, readable hazard warning label. If it is not readable or one is not fitted, obtain one and fit it onto the bottle.

2) Remove the nozzle and trigger from the bottle by unscrewing the top. Rinse the bottle out with fresh, clean water. Fill the 1 L spray bottle with fresh, clean water to the 1 L mark on the neck of the bottle.

3) Add 1 × 1 000 mg effervescent chlorine tablet to the bottle and replace the nozzle and trigger attachment securely, ensuring the nozzle controlling spray from the bottle is in the closed position.

4) Wait for the tablet to fully dissolve (2 min approx.), but allow the solution to stand for 10 min prior to use.

5) Check that the lid is firmly secured then shake the solution for 30 s. If the tablet has fully dissolved the solution is now ready to use.

6) Prior to spraying pipes, hoses, fittings, couplings or tools, remove any surface dirt, soil or debris with a clean cloth or paper towel.

7) Spray the pipes, hoses, fittings, couplings or tools with the chlorine disinfectant solution and ensure all relevant surfaces are covered.

8) The chlorine disinfectant solution is only usable for a period of 24 h from the time of preparation, after which the chlorine disinfectant solution strength will have deteriorated. After 24 h, discard the chlorine disinfectant solution.

9) If additional chlorine disinfectant solution is required after this time period, prepare a fresh chlorine disinfectant solution batch.

10) Dispose of the chlorine disinfectant solution in a safe and environmentally friendly manner. Do not dispose of the chlorine disinfectant solution by pouring onto vegetation or into surface water or surface water drains.

Annex F (informative) Example drinking water tanker or wheeled bowser driver checklist

Figure F.1 is an example of a drinking water tanker/bowser driver checklist.

Figure F.1 **Example drinking water tanker or wheeled bowser driver checklist**

Action	Completed/ Comments (please tick)	Signature	Date
Check wheels, tyres and lights and visually inspect tanker for damage.			
Check onboard pumps; bagged and tagged.			
Check rear fill and discharge couplings.			
Check rear fill and discharge couplings are bagged and tagged. Check seals.			
Check all associated hoses are bagged and tagged. Check seals.			
Check all additional couplings are bagged and tagged. Check seals.			
Check standpipes are bagged and tagged. Check seals.			
Check valve key is present.			
Check you have correct clean PPE; rubber gloves and overalls. Check you have freshly made full hypochlorite spray bottles.			
Check you have completed any required risk assessment, method statement (Water Hygiene Card), log sheets and last cleaned certificate.			
Check you have contact details of any muster point, and name and phone number of Responsible Person.			
Check that you have contact details of those taking samples and chlorine residual measurements (if applicable).			
Confirm that sample and chlorine residual measurements were taken before discharging load into main/SR/WTW clear water tank.			
Confirm completed log sheets, returned to Responsible Person.			
Complete after use checks and inform Responsible Person.			

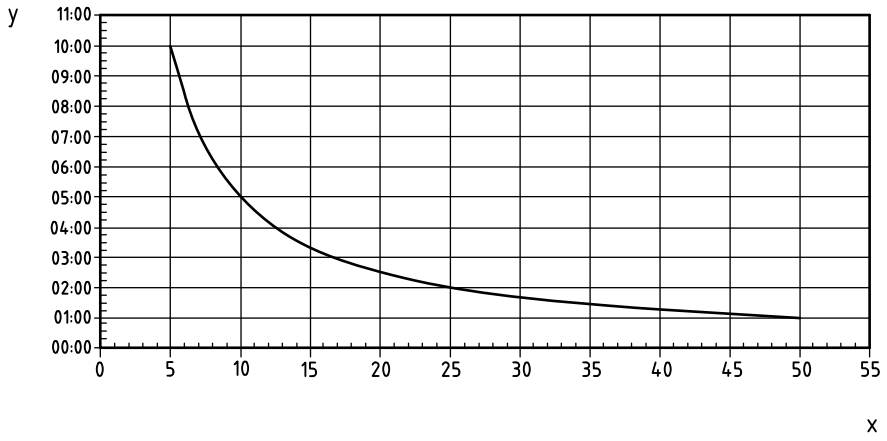
WTW = Water Treatment Works.

Annex G (informative)

Chlorine concentration, contact period for tank disinfection and minimum residual free chlorine

Figure G.1 indicates the initial free chlorine concentration and contact periods for tank disinfection and Figure G.2 indicates minimum residual free chlorine after the contact period.

Figure G.1 **Initial free chlorine concentration and contact period for tank disinfection (see Table 4, columns 1 and 2)**

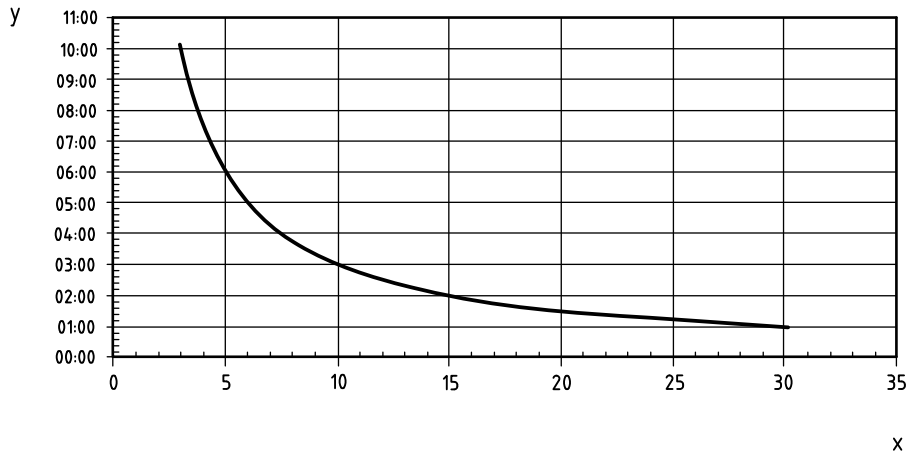


Key

x Free chlorine (mg/L)

y Contact period (h)

Figure G.2 **Minimum residual free chlorine after contact period (see Table 4, column 3)**



Key

x Minimum residual free chlorine measured at the end of the contact period (mg/L)

y Contact period (h)

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