

Drinking Water Safety Plan Template for Specific Development (Hospitals) in Hong Kong



Water Supplies Department

Hong Kong Special Administrative Region Government

Annex II – Template for Specific Developments (Hospitals)

Explanatory Notes:

1. This template is prepared based on recommendations of the World Health Organization (WHO) with an aim to assisting the management staff of a hospital to develop and implement Water Safety Plan (WSP) to enhance water safety.¹ It covers the essential elements of WSPs and common requirements applicable to plumbing layout of hospitals. The template comprises the following components:
 - Introduction
 - Part A – General Description of the Hospital
 - Part B – Water Supply Flow Diagrams
 - Part C – Risk Assessment Summary Table for the Hospital
 - Part D – Routine Water Safety Checklist for the Hospital (Based on **Components** of Checking)
 - Part E – Routine Water Safety Checklist for the Hospital (Based on **Persons** Responsible for Conducting Checking)
2. A Designated Person (DP) should be assigned to oversee the development and implementation of the WSP. DP can be a person familiar with the operations of the hospital, e.g. the staff-in-charge of estate management. DP should be supported by other administrative, maintenance or technical staff and/or infection-control officers to form a WSP team. If required, DP may seek technical advice from a Qualified Person (QP) (such as a Licensed Plumber (LP)) for the development and implementation of the WSP.² DP may also refer to those established guidelines listed in the Reference when formulating the WSP.
3. DP should complete Parts A and B as far as possible with the support from the WSP team members. He/She should then review Part C and select those items applicable to the hospital. For instance, items related to wall-mounted dispensers are not relevant to a hospital without such dispensers. DP should similarly select relevant items in Part D and Part E³ to form a water safety checklist.
4. DP should perform general checking duties and engage QP to conduct specific

¹ If the hospital consists of blocks with distinct internal plumbing systems, separate WSPs may be developed for individual blocks to facilitate risk assessment and implementation.

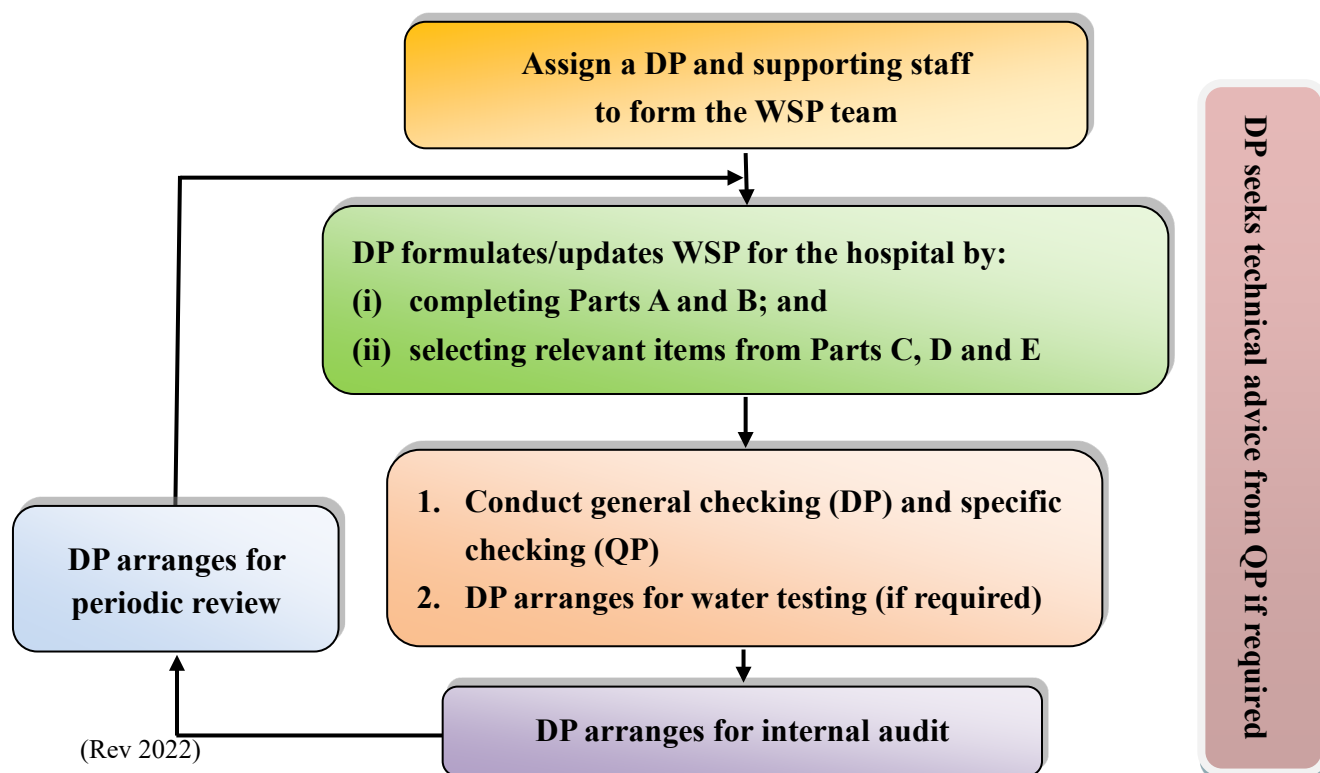
² If necessary, DP may engage relevant consultants to provide technical support. Lists of QPs and consultants trained in WSP for buildings are available from the Water Supplies Department's website (<https://www.wsd.gov.hk/en/water-safety/qualified-persons/index.html>).

³ Parts D and E contain the same checking items listed out in different formats.

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checking according to the checklist.

5. Water testing is normally not required under WSP but, subject to the hospital’s operations, simple checking of disinfectant levels and hot water temperature at water outlets of the hospital is recommended to control biofilm formation in pipes. Please see Sections 4.16 – 4.18 of the Guidelines for Drinking Water Safety Plans for Buildings in Hong Kong and Parts C to E of this template for details.
6. DP should arrange an internal audit at least once every two years. The auditor can be an internal staff or independent party who is not involved in the implementation of WSP. Among other aspects, the auditor should check whether (i) the WSP is up to date and generally accurate; (ii) conditions of the plumbing components tally with the checking records; (iii) staff are trained and competent to carry out the routine checking (e.g. how to check the strainers of taps and shower heads); and (iv) the documents and records are complete. Inspection of records and plumbing components by sampling should normally be sufficient.
7. DP should also arrange a periodic review at least once every two years and following major modifications of the plumbing systems for updating of the WSP as well as addressing the audit findings and other improvements, where applicable. Discussion over the WSP and follow-up actions in a scheduled staff meeting with records can serve the purpose.
8. The steps for the development and implementation of WSP for a hospital are summarised in the following figure.



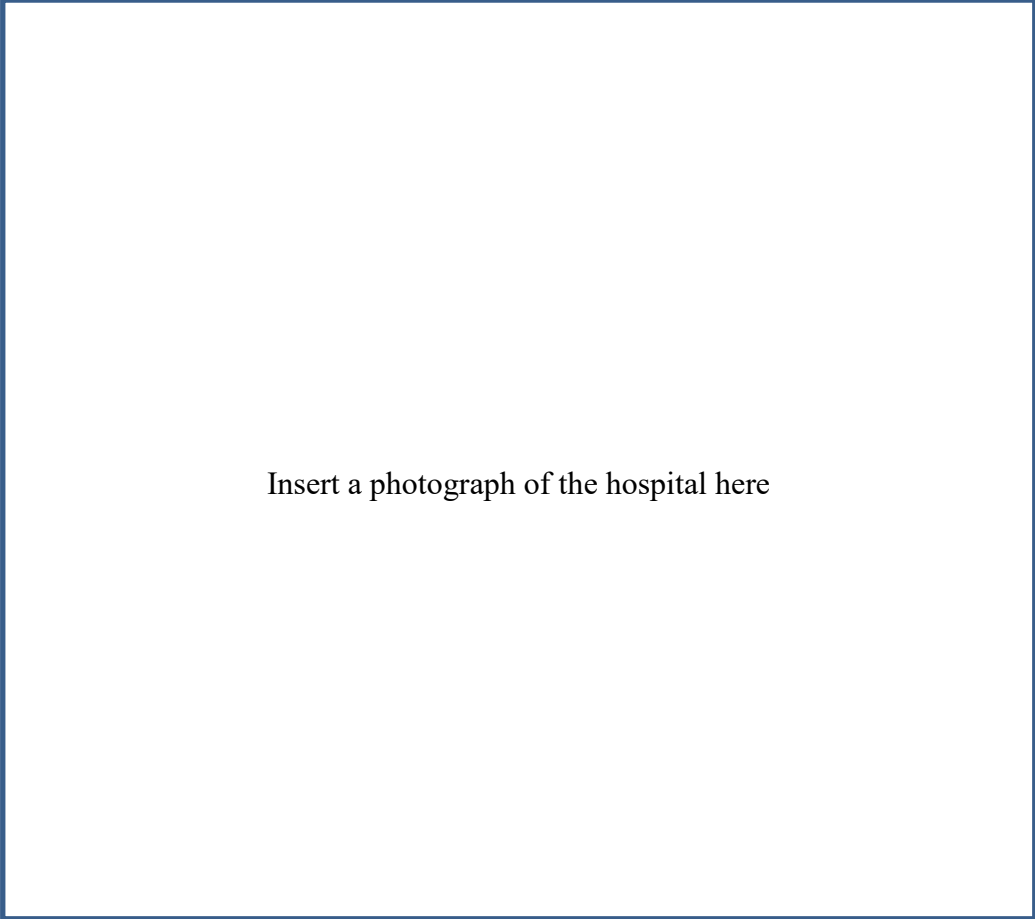
Guidelines for Drinking Water Safety Plans for Buildings in Hong Kong

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Reference

1. CDC (2017) *Developing a Water Management Program to Reduce Legionella Growth & Spread in Buildings A Practical Guide to Implementing Industry Standards*, USA
(<https://www.cdc.gov/legionella/wmp/toolkit/index.html>; accessed on 17 March 2019)
2. Department of Health (2016) *Health Technical Memorandum 04-01: Safe water in healthcare premises – Part B: Operational management*, UK
(<https://www.gov.uk/government/publications/hot-and-cold-water-supply-storage-and-distribution-systems-for-healthcare-premises>; accessed on 17 March 2019)
3. enHealth (2015) *Guidelines for Legionella control in the operation and maintenance of water distribution systems in health and aged care facilities*, Australian Government, Canberra
([https://www.health.gov.au/internet/main/publishing.nsf/content/A12B57E41EC9F326CA257BF0001F9E7D/\\$File/Guidelines-Legionella-control.pdf](https://www.health.gov.au/internet/main/publishing.nsf/content/A12B57E41EC9F326CA257BF0001F9E7D/$File/Guidelines-Legionella-control.pdf); accessed on 17 March 2019)
4. Health and Safety Executive (2014) *Legionnaires' disease Part 2: The control of legionella bacteria in hot and cold water systems*, UK
(<http://www.hse.gov.uk/pUbns/priced/hsg274part2.pdf>; accessed on 17 March 2019)
5. Prevention of Legionnaires' Disease Committee (2016) *Code of Practice for Prevention of Legionnaires' Disease (2016 Edition) (Incorporating Addendum No.01/2018)*, Hong Kong
(https://www.emsd.gov.hk/filemanager/en/content_645/COP-PLD_2016_a0118_en.pdf; accessed on 17 March 2019)
6. WHO (2011) *Water Safety in Buildings*
(https://www.who.int/water_sanitation_health/publications/2011/9789241548106/en/; accessed on 17 March 2019)

Water Safety Plan for <Name of Hospital>



Insert a photograph of the hospital here

<Month Year (of issuing)>

Version No.: _____
Holder: _____
Prepared by: _____ (Name)
 _____ (Post)

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Introduction

1. Water Safety Plan (WSP) was introduced by the World Health Organization (WHO) in 2004 as an effective means of consistently ensuring safety of drinking water supply through risk assessment and risk management.
2. Based on WHO's recommendations, this plan contains the essential elements of WSP with a view to preventing contamination of drinking water in the inside service. The plan is composed of the following parts:
 - Part A – General Description of the Hospital
 - Part B – Water Supply Flow Diagrams
 - Part C – Risk Assessment Summary Table for the Hospital
 - Parts D and E – Routine Water Safety Checklist for the Hospital
3. Part A contains a brief description of the hospital's characteristics including the Designated Person (DP) assigned to oversee the development and implementation of the WSP.
4. Part B contains the schematic flow diagrams indicating the essential plumbing components of the hospital.
5. Part C contains a summary of risk assessment on the hospital's plumbing system.
6. Parts D and E are the routine water safety checklists summarising the checking duties undertaken by DP and Qualified Person (QP) based on the risk assessment.
7. DP performs the general checking duties and a QP is engaged to conduct specific checking according to the checklist.
8. DP arranges internal audits at least once every two years to verify effectiveness of the WSP.
9. DP periodically reviews the WSP at least once every two years and following major modifications of the plumbing systems.

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Part A
General Description of the Hospital

Item	Details
Publication Date and version of WSP	Publication Date: Version:
Person responsible for this WSP (Designated Person)⁴	Name: Position:
Contacts of DP	Telephone: Email:
Name of Hospital	
Address of Hospital	
Owner (if applicable)	
Management Agent (if applicable)	
Maintenance Agent (if applicable)	
Lot Boundary (or Location Map⁵)	
No. of Blocks	
No. of Floors	
No. of Wards (if applicable)	
No. of the Patients and Staff	
Water connection notification or certificate references	<input type="checkbox"/> No <input type="checkbox"/> Yes, file ref. of notification or certificate reference no. issued by the WSD:
Plumbing line diagrams ref. nos.⁶	<input type="checkbox"/> No <input type="checkbox"/> Yes, plumbing line diagrams ref. nos. :

⁴ It is recommended that a Designated Person (DP), such as the staff-in-charge of estate management, be assigned to oversee implementation of the WSP.

⁵ For instance, extracted from Geoinfo Map (<https://www.map.gov.hk>).

⁶ If not available, it is recommended that suitable drawings be created for the hospital.

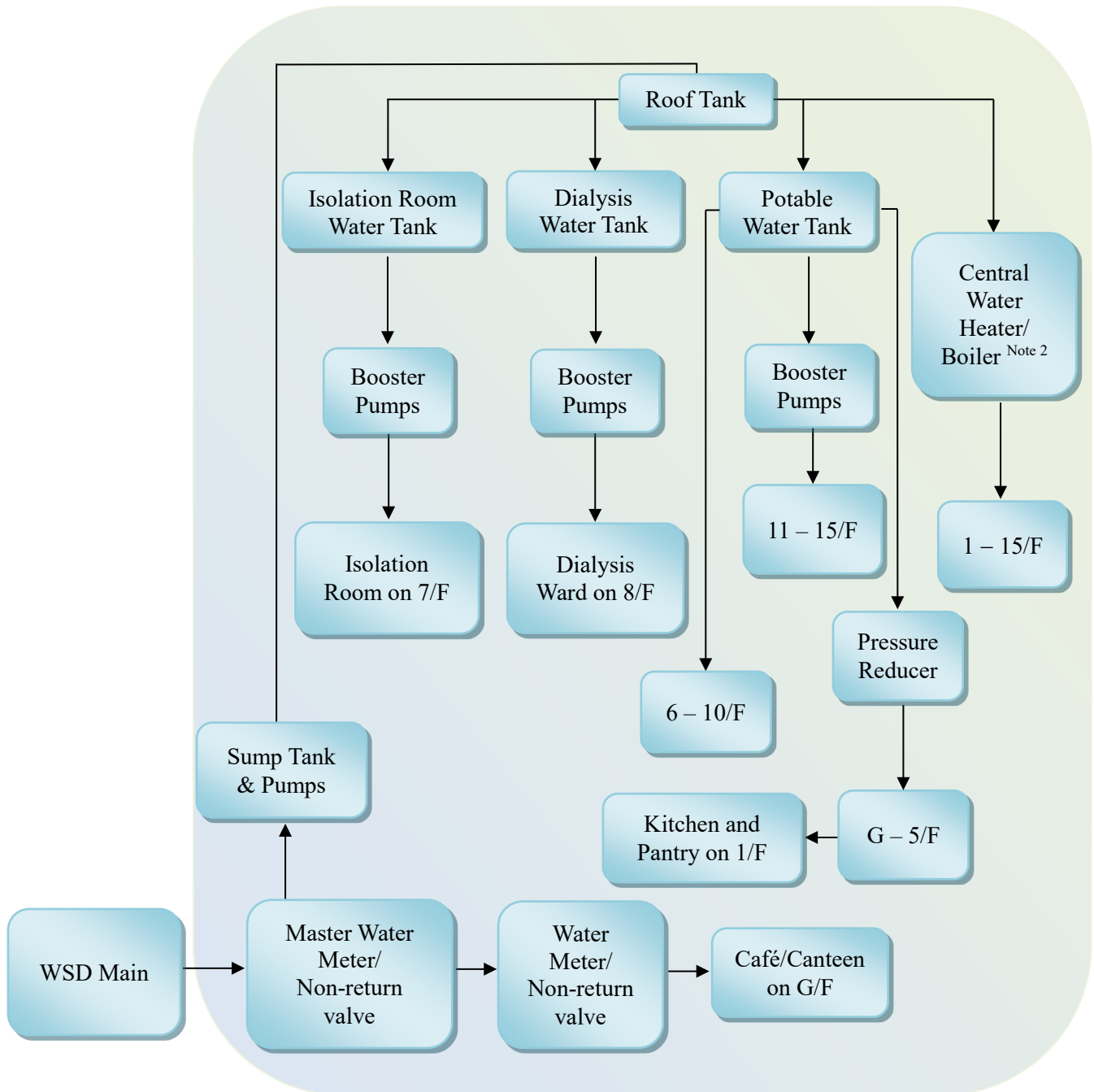
Item	Details
<p>Types of water supply present on site (cross out or add items as appropriate)</p>	<p>(i) Potable water (ii) Seawater flushing water (iii) Air-conditioning cooling water (including cooling tower) (iv) Fire service water (v) Roof-harvested rainwater (vi) Process water (e.g. distilled or reverse-osmosis water for boiler) (vii) Recycled/reclaimed rainwater or sewage (viii) Other (please specify)</p>
<p>Water Quality Testing</p>	<p>1. Routine testing of disinfectant level (if applicable)</p> <p>Testing period: Results: Please see attached records</p> <p>2. Other test parameters (this may refer to a separate schedule):</p> <p>Last testing on: Test report ref. no.: Next testing scheduled:</p>
<p>WSP audit⁷</p>	<p>Auditor Name: Type (Please tick in the appropriate box): <input type="checkbox"/> Internal staff <input type="checkbox"/> Independent party</p> <p>Last audit on: Audit report ref.:</p>

⁷ The auditor can be an internal staff or independent party who is not involved in the implementation of WSP. Preferably, the auditor shall have undergone training related to internal audit of quality management system.

Part B
Water Supply Flow Diagrams ^{Note 1}
Based on as-built plumbing line diagrams ref. no. xxxx (if applicable)⁸
(Illustrative Examples)

1. Water supply flow diagram for the block

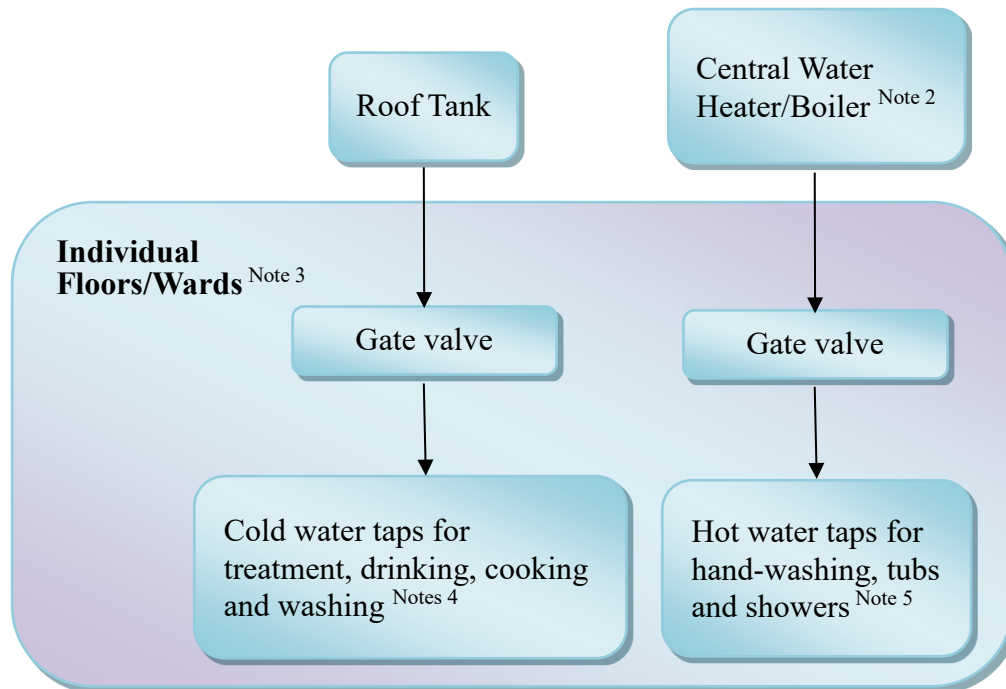
Name of block (if applicable): _____



⁸ If the latest as-built drawings are not available, please indicate how the schematic diagrams are constructed, e.g. “Based on inspection undertaken by [name of QP] in [Month-Year].”

2. Water supply flow diagram for individual floors or wards

Name of block (if applicable): _____



Note 1 The hospital may describe the internal plumbing system in other appropriate formats to facilitate risk assessment.

Note 2 Please modify if decentralised water heaters for individual floors/wards are installed instead.

Note 3 If applicable, it is suggested that a list of taps and point-of-use (POU) devices be maintained for each floor/ward.

Note 4 Please state details such as “Water served for drinking on 1 – 10/F are filtered and boiled”, “All water for Isolation Room on 7/F is filtered”, etc.

Note 5 Please state details such as “Tubs and showers are installed on 3/F and 3 – 10/F, respectively”. Please state in particular if hot and cold water is mixed for warm water supply, e.g. “Thermostatic mixing valve is used at the Paediatric Ward on 3/F ”.

Part C
Risk Assessment Summary Table for the Hospital⁹

Hazards (chemical, microbial or physical contaminant) / Hazardous Events (causes of excessive levels of, or exposure to, hazards)	Likelihood	Consequence	Risk	Recommended Control Measures	Recommended Monitoring Procedures
<p>1. Stagnation of water leading to stale water with possible slime or biofilm formation.</p> <p>This situation could cause unpleasant tastes or odours leading to users' complaints or reluctance to use the water.</p>	Likely	Minor	Moderate	<p>1. Minimise dead-legs in plumbing system</p> <p>2. Respond to the patient or staff's complaints on water quality</p> <p>3. Remind staff to flush idle or infrequently-used taps and showerheads</p>	<p>1. Construct plumbing system following WSD's instructions and arrange for submissions and inspection as required. Maintain copies of the submitted documents (By DP and LP)</p>
<p>2. Storing and supplying water at temperatures in the range 20°C to 46°C that are favourable to the growth of opportunistic pathogens (including, but not limited to, legionellae).</p> <p>These pathogens could potentially cause infections and serious illnesses, including Legionnaires' disease to which immunocompromised people are more susceptible.</p>	Rare	Major	Low	<p>4. Flushing before first occupancy and after major plumbing works as well as after prolonged periods of non-use</p> <p>5. Install backflow prevention devices to prevent backflow of water from known dead-legs into the main water supply system where applicable</p> <p>6. Properly operate and maintain the hot and cold water systems to prevent Legionnaires' disease</p> <p>7. Maintain residual free chlorine or other disinfectants within the internal plumbing system</p>	<p>2. Review and set up flushing programme with LP and conduct flushing of:</p> <ol style="list-style-type: none"> a. known dead-legs (if present) b. idle or infrequently-used taps and showerheads (if present) c. prior to first occupancy after building construction or plumbing modification d. in response to the patient or staff noticing water quality of problems (By DP) <p>3. Inspect and maintain backflow prevention devices (By LP)</p> <p>4. Regular inspection and maintenance of hot water devices (e.g. central heat exchanger or storage type water heaters) and operate the devices at 60°C or above, with water temperature at the outlets at 55 °C or above (where applicable) (Caution: To prevent accidental scalding, the hot water temperature at the tap outlets to be used by patients with decreased self-caring ability such as paediatric patients should not be higher than 43°C) (By DP)</p> <p>5. Regularly inspect strainers in water taps and shower heads for excessive buildup of deposits or scales. Arrange cleaning and replacement if required. (where applicable) (By DP)</p> <p>6. For each floor/ward identify as far as practicable cold water "sentinel taps", i.e. those cold water taps supplying water for drinking, food-preparation, ice-making, washing, tubs,</p>

⁹ **Note:**

- (i) A directory of approved plumbing components is available via: <http://www.wsd.gov.hk/en/plumbing-engineering/pipes-and-fittings-to-be-used-in-inside-service-or/index.html>
- (ii) DP refers to the Designated Person e.g. staff-in-charge of estate management or another party who oversees implementation of the WSP
- (iii) LP refers to Licensed Plumber as an example of QPs and consultants who are competent and engaged by DP to carry out the duties. LP is used as an example in the table primarily to enhance comprehensibility of users.
- (iv) Please see Part D for frequency of checking and corrective actions.
- (v) Content of the table may be modified as appropriate subject to the hospital's risk assessment.
- (vi) Control measures, monitoring procedures and detailed information of prevention of Legionnaires' disease (in relation to items 1 and 2 above) are available in "Code of Practice for Prevention of Legionnaires' Disease" (available via https://www.emsd.gov.hk/en/supporting_government_initiatives/legionnaires_disease/publications/codes_of_practice/index.html)
- (vii) Tips for using wall-mounted dispensers are available via https://www.wsd.gov.hk/filemanager/en/share/pdf/tips_for_using_wall_mounted_dispensers_e.pdf
- (viii) Free residual chlorine in water is detectable at about 0.1 mg/L.
- (ix) Please refer to WSD's "Technical Requirement for Plumbing Works in Buildings" for the requirements of backflow prevention devices for water dispensers (<https://www.wsd.gov.hk/en/plumbing-engineering/requirements-for-plumbing-installation/technical-requirements-for-plumbing-works-in-bldgs/index.html>).
- (x) Procedure for cleansing water tanks is available via: <https://www.wsd.gov.hk/en/faqs/index.html#12-205>. DP shall ensure that all rinsing water of the tanks is drained away before refilling with fresh water.

Hazards (chemical, microbial or physical contaminant) / Hazardous Events (causes of excessive levels of, or exposure to, hazards)	Likelihood	Consequence	Risk	Recommended Control Measures	Recommended Monitoring Procedures
					<p>showering, etc. which have the lowest residual disinfectant levels due to plumbing layout or frequency of use and are available for regular measurements . Regularly conduct flushing and measure residual disinfectant levels of these sentinel taps (By DP)</p> <p>7. Also identify as far as practicable hot water “sentinel taps” for each floor/ward which have the lowest temperature due to plumbing layout and are available for regular measurements . Regularly check the hot water temperature of these sentinel taps (By DP)</p>
<p>3. Excessive leaching of hazardous metals (e.g. lead, copper, cadmium, chromium, antimony, nickel, or iron from metal pipes or plasticisers from plastic pipes) from inappropriate plumbing materials or due to long stagnation of water.</p> <p>This may cause metallic tastes, discoloured water or stained washing and fittings (blue from copper, brown from iron), or even adverse health effects after prolonged exposure.</p>	Likely	Moderate	High	<ol style="list-style-type: none"> 1. Construct plumbing system and carry out repairs or plumbing modifications in accordance with WSD’s instructions 2. Use plumbing materials approved by WSD for all new plumbing works and repair or replacement of plumbing 3. Remind staff to flush idle or infrequently-used taps 	<ol style="list-style-type: none"> 1. Engage LP to construct plumbing system and carry out plumbing works and arrange for submissions and inspection according to WSD’s instructions. Maintain copies of the submitted documents (By DP) 2. Review and set up flushing programme with LP and conduct flushing of: <ol style="list-style-type: none"> a. known dead-legs (if present) b. idle or infrequently-used taps (if present) c. prior to first occupancy after building construction or plumbing modification d. in response to the patient or staff noticing of water quality problems (By DP)
<p>4. Transfer of hazardous organics (e.g. petrochemicals or paint strippers) through plastic pipes due to use of inappropriate plumbing materials. This commonly results from polyethylene pipes being laid in ground that is, or becomes, contaminated by fuel spills or spillage of other organic chemicals.</p> <p>This may cause petrochemical tastes or even adverse health effects after prolonged exposure.</p>	Likely	Moderate	High	<ol style="list-style-type: none"> 4. Flushing before first occupancy and after major plumbing works as well as after prolonged periods of non-use 5. Install backflow prevention devices to prevent backflow of contaminated water into the main water supply system where applicable 	<ol style="list-style-type: none"> 3. Inspect and maintain backflow prevention devices (By LP)
<p>5. Cross-connection between potable* and non-potable water supplies leading to possible contaminants from the non-potable water causing unpleasant taste (e.g. saltiness), odours or hazardous substances (e.g. pathogens from non-potable water) to enter the potable water system.</p> <p>The problem can arise due to drinking taps being connected to the wrong water pipe or due to the unauthorised inter-connection of potable and non-potable water pipes.</p> <p>This can cause tastes or odours that water users find unpleasant and that may in turn make water users feel unwell or could even cause illness due to hazardous substances (pathogenic microorganisms or chemicals) being present in the water.</p> <p>* Potable water refers to water for drinking, food preparation and hygienic uses such as bathing, showering, hand washing, etc.</p>	Rare	Major	Low	<ol style="list-style-type: none"> 1. Carry out plumbing works according to WSD’s instructions and avoid cross-connection in plumbing system 2. If applicable, set pump pressures, so that the potable water is at higher pressure than all non-potable water (typically with the potable water system being at least 50 kPa above the non-potable water system pressure) to prevent non-potable water from flowing into the potable water. 3. Retain as-built drawings and plumbing diagrams for all plumbing works and plumbing modifications following completion of works as far as practicable 4. Install backflow prevention devices to prevent backflow of non-potable water into the potable water supply system 5. Clearly differentiate potable and non-potable water pipes/tanks using labels/colours 6. Ensure potable water taps are not connected to the non-potable water system (if present) 	<ol style="list-style-type: none"> 1. Engage LP to carry out plumbing works and arrange for submissions and inspection according to WSD’s instructions. Maintain copies of the submitted documents (By DP) 2. Set and check set points for pump pressure, roof tank level and pressure reducing valve (By LP) 3. Inspect and maintain water pumps (By DP and LP) 4. Regular inspection of roof tank levels (By DP) 5. Check if as-built plumbing drawings have been updated following plumbing works (By DP) 6. Inspect and maintain backflow prevention devices (By LP) 7. Check if potable and non-potable pipes/tanks have been differentiated with labels/colours (By DP and LP) 8. Check if labels/colour markings on potable and non-potable water pipes/tanks are intact (where applicable) (By DP) 9. Conduct flow tests after construction or modifications of plumbing system to demonstrate that potable water are not connected to the non-potable water system (where applicable). (By DP and LP)

Hazards (chemical, microbial or physical contaminant) / Hazardous Events (causes of excessive levels of, or exposure to, hazards)	Likelihood	Consequence	Risk	Recommended Control Measures	Recommended Monitoring Procedures
<p>6. Ingress of contaminants due to pipe breaks, leakages or plumbing modifications and loss of water pressure leading to possible contaminants causing unpleasant taste, odours or hazardous substances to enter the potable water system.</p> <p>The problem can arise if there is a leak in the potable water system that whilst it would normally cause water to flow out could equally allow contaminated water to flow in if the pressure in the pipe is lost or low.</p> <p>This can cause tastes or odours that water users find unpleasant and that may in turn make water users feel unwell or could even cause illness due to hazardous substances (pathogenic microorganisms or chemicals) being present in the water.</p>	Rare	Major	Low	<ol style="list-style-type: none"> 1. Construct plumbing system and carry out plumbing modifications in accordance with WSD's instructions 2. Maintain sufficient water pressure 3. Flush pipes and fittings to bring in clean water and flush out any possible contamination that may have entered via leaks following loss of water pressure 4. Repair and replace leaking pipes, joints or fittings 	<ol style="list-style-type: none"> 1. Engage LP to construct plumbing system or carry out plumbing modifications according to WSD's instructions (By DP) 2. Set and check set points for pump pressure, roof tank level and pressure reducing valve (By LP) 3. Inspect and maintain water pumps (By DP and LP) 4. Regular inspection of roof tank levels (By DP) 5. Ensure sufficient flushing after plumbing modifications or loss of water pressure (By DP and LP) 6. Inspection of inside service for leaks (By DP)
<p>7. Backflow of hazardous substance into potable water system leading to possible contaminants causing unpleasant taste, odours or hazardous substances to enter the potable water system.</p> <p>The problem can arise whenever the potable water system is physically connected to, for instance, point-of-use (POU) devices requiring chemical cleansing or a container of chemicals, particularly if the hazardous liquid is pressurised and pushes the hazardous chemical back into the water supply, or if the water supply loses pressure and sucks the hazardous chemical into the water supply.</p> <p>This can cause tastes or odours that water users find unpleasant and that may in turn make water users feel unwell or could even cause illness due to hazardous substances (chemicals) being present in the water.</p>	Rare	Major	Low	<ol style="list-style-type: none"> 1. Construct plumbing system in accordance with WSD's instructions 2. Maintain sufficient water pressure 3. Install backflow prevention devices between the water supply plumbing and any possible connection to any potentially hazardous liquid to prevent backflow of contaminated water into the potable water supply system where applicable 	<ol style="list-style-type: none"> 1. Engage LP to construct plumbing system or carry out plumbing modifications and arrange for submissions and inspection according to WSD's instructions. Maintain copies of the submitted documents (By DP) 2. Set and check set points for pump pressure, roof tank level and pressure reducing valve (By LP) 3. Inspect and maintain water pumps (By DP and LP) 4. Regular inspection of roof tank levels (By DP) 5. Inspect and maintain backflow prevention devices (By LP)
<p>8. Entry of hazardous substance into potable water tanks (sump tank or roof tank) leading to possible unpleasant tastes, odours or hazardous substances present in the potable water system.</p> <p>The problem can arise due to deliberate contamination of the water tank or due to birds, animals or insects getting into the water tank. Water accumulation on the tank roof may also lead to seeping or overflowing of contaminated water into the water tank.</p> <p>This can cause tastes or odours that water users find unpleasant and that may in turn make water users feel unwell or could even cause illness due to hazardous substances (pathogenic microorganisms or chemicals) being present in the water.</p>	Rare	Catastrophic	Low	<ol style="list-style-type: none"> 1. Ensure proper design, construction and maintenance of water storages such as sump and roof tanks 2. Keep sump and roof tank room (if available) locked 3. Keep sump and roof tank access hatch locked and secure 4. Prevent entry of birds, animals or insects into the water tanks by sealing all holes and protecting any vents and overflow pipes using gnaw-proof mesh 5. Ensure cleanliness of sump and roof tanks e.g. through DP inspecting and arranging cleansing of sump and roof tanks as required 6. Ensure no water and debris (leaves, twigs, etc.) accumulation on exposed tank roof and rainwater drains free from blockage 	<ol style="list-style-type: none"> 1. Engage LP to construct storage tanks and arrange for submissions and inspection according to WSD's instructions. Maintain copies of the submitted documents (By DP) 2. Inspect sump and roof tank rooms (if available) and tank covers (By DP) 3. Inspect air vents and overflow pipes of sump and roof tanks (By DP) 4. Inspect sump and roof tank interiors (By DP) 5. Arrange for regular cleansing of sump and roof tanks in accordance with WSD's instructions. (By DP) 6. Inspect exposed tank and rainwater drains (By DP)

Hazards (chemical, microbial or physical contaminant) / Hazardous Events (causes of excessive levels of, or exposure to, hazards)	Likelihood	Consequence	Risk	Recommended Control Measures	Recommended Monitoring Procedures
<p>9. Inappropriate alterations or repairs to plumbing by persons not authorised, licensed or trained to make such alterations or repairs. This can lead to contamination of the water supply through a range of pathways.</p> <p>Use of the wrong plumbing materials could result in hazardous chemicals (such as lead) being present in the water.</p> <p>Cross-connections could arise resulting in potable water taps supplying non-potable water.</p> <p>Connections could be made between potable water and hazardous liquids without the required backflow prevention systems being in place, which could result in hazardous chemicals being forced at pressure, or sucked in via backflow, into the water supply.</p> <p>This can cause tastes or odours that water users find unpleasant and that may in turn make water users feel unwell or could even cause illness due to hazardous substances (pathogenic microorganisms or chemicals) being present in the water.</p>	Likely	Moderate	High	<ol style="list-style-type: none"> 1. Carry out plumbing modifications in accordance with WSD's instructions 2. Use plumbing materials approved by WSD for all new buildings, new plumbing works and repair or replacement of plumbing 3. Install backflow prevention devices between the water supply plumbing and any possible connection to any potentially hazardous liquid to prevent backflow of contaminated water into the potable water supply system where applicable 4. Clearly differentiate potable and non-potable water pipes/tanks using labels/colours as far as practicable 5. Provide advice to staff about the importance of not carrying out inappropriate alterations to plumbing 	<ol style="list-style-type: none"> 1. Engage LP to construct plumbing system or carry out repairs or plumbing modifications and arrange for submissions and inspection according to WSD's instructions. Maintain copies of the submitted documents (By DP) 2. Inspect and maintain backflow prevention devices (By LP) 3. Check if potable and non-potable pipes/tanks have been differentiated with labels/colours (By DP and LP) 4. Check if labels/colour markings on potable and non-potable water pipes/tanks are intact (where applicable) (By DP)
<p>10. Contamination of drinking water due to inappropriate installation, operation or maintenance of POU devices fitted to drinking taps or connected to water mains.</p> <p>The problem can arise if the POU devices such as reverse osmosis equipment, water filters or wall-mounted dispensers are not properly installed, operated or maintained, e.g. use of inappropriate filters, wall-mounted dispensers or plumbing materials, leakages, water stagnant in wall-mounted dispensers and the inlet pipes for prolonged periods, overloading of filter cartridges leading to release of hazardous substances, breakthrough, backflow of substances accumulated in filter cartridges into water supply during low or loss of water pressure, etc.</p> <p>This can cause tastes or odours that water users find unpleasant and that may in turn make water users feel unwell or could even cause illness due to hazardous substances (pathogenic microorganisms or chemicals) being present in the water.</p>	Rare	Major	Low	<ol style="list-style-type: none"> 1. Ensure selection and proper installation of appropriate model of POU devices 2. Ensure POU devices are properly operated and maintained 3. Regularly flush wall-mounted dispensers and the inlet pipes according to the drinking habits, e.g. conduct flushing before breakfast if the wall-mounted dispenser is idle after dinner until morning 	<ol style="list-style-type: none"> 1. Consult Qualified Persons (QPs) for selection of POU devices, e.g. appropriately certified products (By DP) 2. Engage LP or other appropriate qualified persons to install POU devices according to manufacturer's product instructions and WSD's plumbing instructions (By DP) 3. Operate, inspect and maintain POU devices, including change of filter cartridges according to manufacturer's instructions (By DP) 4. Review, set up and conduct flushing programme for wall-mounted dispensers and inlet pipes according to the drinking habits (By DP)

Part D
Routine Water Safety Checklist for the Hospital (Based on Components of Checking)¹⁰

Location of check or action	Typical frequency of check or action	Typical person responsible for check or action ¹¹	Item to check or action to be completed and target to be achieved	Hazard/ Hazardous Event No. in Part C	Corrective action to take if target is not achieved
1. Water storage tanks (sump tank, roof tank, header tank or any other storage tanks)	Monthly	DP	The tank room (if available) is locked and secure	8	Secure and lock the tank room
			The tank access hatch is locked and secure	8	Secure and lock the tank access hatch
			There are no holes, gaps or entry points through which insects, animals or birds could enter into the tanks	8	Repair any holes or replace part that has holes
			Tank vents and overflow pipes have fine, gnaw-proof insect-proof mesh and the mesh is secure and intact	8	Repair or replace any mesh
			Tanks are clean inside and are free of foreign materials or deposits	8	Arrange cleansing of the tanks
			No water and debris (leaves, twigs, etc.) accumulated on exposed tank roof and the rain water drains are free from blockage	8	Remove accumulated water and debris and clear rainwater drains
	Half yearly	DP	Tanks are cleansed every 6 months ¹²	8	Arrange cleansing of the tanks
Annually	LP	Potable water roof tank (header) levels are set to provide sufficient water pressure and level switch top up control is functioning correctly	5-7	Adjust level settings if required and make any necessary repairs	
2. Water pumps (sump pumps or booster pumps)	Monthly	DP	There is no leakage	5-7	Repair or replace the leaking part
	Monthly	DP	There is no unusual noise during pump operations	5-7	Repair or replace the pump
	Annually	LP	Pump pressure set points are correctly adjusted to provide sufficient water pressure and the pressure measurement devices and pumps are functioning correctly	5-7	Adjust pressure settings if required and make any necessary repairs
	Annually	LP	Pressure and level set points for the potable water are higher (typically by at least 50 kPa, if feasible) than for non-potable water (where applicable)	5-7	
	Annually (or according to supplier's instructions)	LP	Maintain pumps as recommended by the supplier (this may entail actions such as replacing worn parts, bleeding air and lubricating to minimise noise and risk of failure) and check for evidence of parts being badly worn	5-7	Replace badly worn parts in good time so that the pump doesn't fail resulting in a loss of pressure.
3. Pressure reducing valves	Annually	LP	Pressure reducing valve set points are correctly adjusted to provide sufficient water pressure and the pressure measurement devices are functioning correctly	5-7	Adjust pressure settings if required and make any necessary repairs
			Pressure and level set points for the potable water are higher (typically by at least 50 kPa, if feasible) than for non-potable water (where applicable)	5-7	
4. Water meters	Annually	LP	Backflow prevention devices are in place as required under the WSD requirements and are found to be functioning correctly ¹³	1-5, 7 & 9	Install back flow prevention devices if missing and replace any faulty devices
5. Pipes, joints and fittings	Every 3 months	DP	Confirm that there are no leaks in pipes, joints or fittings that might indicate pipe failure and the possibility of ingress of contaminated water via the leaks if water pressure is lost	6	Ask LP to replace or repair leaking pipes or joints and to check other nearby pipes or joints of similar age to see if preventive replacement is required
	Annually	DP	Confirm that labels/colour markings on water pipes/tanks are clear to differentiate between potable and non-potable water systems (where applicable)	5 & 9	Add or replace any missing or unclear labels/colour markings

¹⁰ Estate management staff is encouraged to incorporate the Checklist into the hospital's routine maintenance schedule. The table may be rearranged according to location, check frequency or person responsible for the checking. Content of the checklist may be modified as appropriate subject to the hospital's risk assessment. Alternative checking frequencies may be adopted with appropriate justifications.

¹¹ LP refers to Licensed Plumber as an example of QPs and consultants who are competent and engaged by DP to carry out the duties. LP is used as an example in the table primarily to enhance comprehensibility of users.

¹² Water storage tanks may be cleansed more frequently if required. Procedure for cleansing water tanks is available via: <http://www.wsd.gov.hk/en/faqs/index.html#12-205>. DP shall ensure that all rinsing water of the tanks is drained away before refilling with fresh water.

¹³ It may not be feasible to check whether the backflow prevention devices are functioning if the water supply system is on line.

Location of check or action	Typical frequency of check or action	Typical person responsible for check or action ¹¹	Item to check or action to be completed and target to be achieved	Hazard/ Hazardous Event No. in Part C	Corrective action to take if target is not achieved
	In response to complaints	DP	Flush the tap at its maximum practicable flow rate until stagnant water has been replaced by fresh water. The flushing period is typically about 2 minutes or longer for larger systems. Flushing should continue until the water is visibly clear and colourless when viewed in a glass or white cup and has no noticeable taste or odour	1-4	Advise WSD if problem persists
	Annually	LP	Confirm that there are no cross-connections at the main plants that could lead to non-potable water (where applicable) flowing from potable water fittings by conducting checks such as flow tests	5	Remove any cross-connections if identified
6. The cold water sentinel taps of each floor/ward supplying water for drinking, food-preparation, ice-making, washing, tubs, showers, etc. ¹⁴	Twice every month or more frequent as required	DP	Flush the tap (where applicable) at its maximum practicable flow rate until stagnant water has been replaced by fresh water. The flushing period is typically about 2 minutes or longer for larger systems. Flushing should continue until the water is visibly clear and colourless when viewed in a glass or white cup and has no noticeable taste or odour. Confirm that detectable free residual chlorine is present after flushing. If other disinfectants are used in the hospital, confirm that manufacturer's recommended level of residual disinfectant is present.	1-4	Keep flushing until fresh water has been drawn through Flush other taps within the floor/ward and ensure presence of detectable residual chlorine, or sufficient disinfectant level as recommended by manufacturer, after flushing If free residual chlorine or sufficient disinfectant level cannot be established even after prolonged flushing, check with a LP and/or the disinfectant supplier. Alert WSD and/or infection-control officer if necessary Increase flushing frequency if stagnant, metallic, discoloured or smelly water is noticed in between flushing events. Advise WSD if problem persists
7. POU devices fitted to drinking taps or connected to the water mains ¹⁵	According to supplier's instructions	DP	Inspect and maintain POU devices according to supplier's instructions to ensure proper operation. Mark filter cartridge expiry dates on the casings and replace cartridges accordingly. Flush water dispensers (where applicable) according to supplier's instructions or Department of Health's health advice. ¹⁶	10	Ask supplier or qualified technician to repair POU devices if necessary. Mark filter cartridge expiry dates on the casings and replace cartridges accordingly
8. Wall-mounted dispensers ¹⁷	As required	DP	Flush wall-mounted dispensers and the inlet pipes regularly according to the drinking habit e.g. conduct flushing before breakfast if the wall-mounted dispenser is idle after dinner until morning.	10	Set up regular flushing programme and implement flushing.
9. Strainers in at least one water tap and shower head of each floor/ward	Quarterly (or according to supplier's instructions)	DP	Inspect strainers in at least one water tap (e.g. the sentinel taps) and shower head of each floor/ward. Confirm that there is no excessive buildup of deposits or scales.	1	Check strainers in other water taps and shower heads of the floor/ward. Arrange cleaning or replacement of strainers if necessary.
10. Hot water devices (e.g. central heat exchanger or storage type water heaters, thermostatic mixing valves, etc.)	Monthly or more frequent as required	DP	Confirm that the hot water devices operate at 60°C or above, and the hot water temperature at the hot water sentinel taps is not lower than 55°C (Caution: To prevent accidental scalding, the hot water temperature at the tap outlets used by patients with decreased self-caring ability should not be higher than 43°C)	1	Adjust the operation temperature of the hot water devices. Arrange maintenance if the temperature cannot be suitably adjusted.
	Monthly or more frequent as required	DP	Confirm that the water temperature at hot water inlet to thermostatic mixing valves is not lower than 55°C, and that at the water outlet is not higher than 43°C (if applicable)	1	Adjust the operation temperature of the thermostatic mixing valves. Arrange maintenance if the temperature cannot be

¹⁴ For item nos. 6, 9 and 10, if the hospital has taken alternative measures to control microbiological growth in the hot and cold water systems, please record the details including the checking procedure, goal, frequency and corrective actions.

¹⁵ Please refer to WSD's "Technical Requirement for Plumbing Works in Buildings" for the requirements of backflow prevention devices for water dispensers (<https://www.wsd.gov.hk/en/plumbing-engineering/requirements-for-plumbing-installation/technical-requirements-for-plumbing-works-in-bldgs/index.html>).

¹⁶ Department of Health's "Health Advice on Using Water Dispensers" is available via: https://www.chp.gov.hk/files/pdf/guidelines_on_use_of_drink_fountain_public.pdf

¹⁷ Tips for using wall-mounted dispensers are available via: http://www.wsd.gov.hk/filemanager/en/share/pdf/tips_for_using_wall_mounted_dispensers_e.pdf

Location of check or action	Typical frequency of check or action	Typical person responsible for check or action ¹¹	Item to check or action to be completed and target to be achieved	Hazard/ Hazardous Event No. in Part C	Corrective action to take if target is not achieved
					suitably adjusted.
	Annually (or according to supplier's instructions)	DP	Inspect and maintain the hot water devices (including any thermostatic mixing valves) according to the supplier's recommendations. Engage appropriate maintenance technician to carry out the tasks if required.	1	Arrange inspection and maintenance of hot water devices.
11. Notification or advice on notice boards	Monthly or as required	DP	Check if updated versions of the following notification or advice, if appropriate, are available to water users through notice board or other means: i. Flushing advice after long stagnation, e.g. after long vacancy. ¹⁸ ii. Do not take water from hot water tap for drinking water purpose. iii. Any scheduled/non-scheduled suspension of water supply. Flushing of taps for at least 2 minutes before use upon resumption of water supply. iv. Refer to WSD's "Water Use Tips" if necessary. ¹⁹	1-4, 9 & 10	Update any notification provided on plumbing and inside services

¹⁸ Typical flushing advice is available via: http://www.wsd.gov.hk/filemanager/en/share/pdf/tips_to_reduce_lead_intake_e.pdf

¹⁹ WSD's Water Use Tips is available via: <https://www.wsd.gov.hk/en/core-businesses/water-quality/water-use-tips/index.html>

Part E

Routine Water Safety Checklist for the Hospital (Based on Persons Responsible for Conducting Checking)²⁰

Table I. Routine checking/inspection by the Designated Person (such as the staff-in-charge of estate management)

Location	Typical frequency	Item to check/action to be completed/target to be achieved	Observations	Action completed [sign and date]	Corrective action to take if target is not achieved	Corrective action completed [sign and date]
1. Water storage tanks (sump tank, roof tank, header tank or any other storage tanks)	Monthly	The tank room (if available) is locked and secure			Secure and lock the tank room	
		The tank access hatch is locked and secure			Secure and lock the tank access hatch	
		No holes, gaps or entry points into the water tanks through which insects, animals or birds could enter			Repair any holes or replace part that has holes	
		Tank vents and overflow pipes have fine, gnaw-proof insect-proof mesh, and the mesh is secure and intact			Repair or replace mesh	
		Tanks are clean inside and are free of foreign materials or deposits			Arrange cleansing of the tanks	
	No water and debris (leaves, twigs, etc.) accumulated on exposed tank roof and the rain water drains are free from blockage			Remove accumulated water and debris and clear rain water drains		
	Half yearly	Tanks are cleansed every 6 months ²¹			Arrange cleansing of the tanks	
2. Water pumps (sump pumps or booster pumps)	Monthly	There is no leakage			Repair leak or replacement	
	Monthly	There is no unusual noise during pump operations			Repair or replace the pump	
3. Pipes, joints and fittings	Every 3 months	There is no leak in pipes, joints or fittings			Replace or repair leaking pipes or joints	
	Annually	Labels/colour markings on water pipes/tanks are clear to differentiate between potable and non-potable water systems (where applicable)			Replace labels/colour markings	
	In response to complaints	Flush the tap at its maximum practicable flow rate until stagnant water has been replaced by fresh water. The flushing period is typically about 2 minutes or longer for larger systems. Flushing should continue until the water is visibly clear and colourless when viewed in a glass or white cup and has no noticeable taste or odour.			Advise WSD if problem persists	
4. The cold water sentinel taps of each floor/ward supplying water for drinking, food-preparation, ice-making, washing, tubs, showers, etc. ²²	Twice every month or more frequent as required	Flush the tap at its maximum practicable flow rate until stagnant water has been replaced by fresh water. The flushing period is typically about 2 minutes or longer for larger systems. Flushing should continue until the water is visibly clear and colourless when viewed in a glass or white cup and has no noticeable taste or odour. Confirm that detectable free residual chlorine is present after flushing. If other disinfectants are used in the hospital, confirm that manufacturer's recommended level of residual disinfectant is present.			<p>Keep flushing until fresh water has been drawn through.</p> <p>Flush other taps within the floor/ward and ensure presence of detectable residual chlorine, or sufficient disinfectant level as recommended by manufacturer, after flushing.</p> <p>If free residual chlorine or sufficient disinfectant level cannot be established even after prolonged flushing, check with a LP²³ and/or the disinfectant supplier. Alert WSD and/or infection-control officer if necessary.</p>	

²⁰ Estate management is encouraged to incorporate the Checklist into the hospital's routine maintenance schedule. The table may be rearranged according to location, check frequency or person responsible for the checking. Content of the checklist may be modified as appropriate subject to the hospital's risk assessment. Alternative checking frequencies may be adopted with appropriate justifications.

²¹ Water storage tanks may be cleansed more frequently if required. Procedure for cleansing water tanks is available via: <http://www.wsd.gov.hk/en/faqs/index.html#12-205>. DP shall ensure that all rinsing water of the tanks is drained away before refilling with fresh water.

²² For item nos. 4, 7 and 8, if the hospital has taken alternative measures to control microbiological growth in the hot and cold water systems, please record the details including the checking procedure, goal, frequency and corrective actions.

²³ LP refers to Licensed Plumber as an example of QPs and consultants who are competent and engaged by DP to carry out the duties. LP is used as an example in the table primarily to enhance comprehensibility of users by avoiding strange term.

Location	Typical frequency	Item to check/action to be completed/target to be achieved	Observations	Action completed [sign and date]	Corrective action to take if target is not achieved	Corrective action completed [sign and date]
					Increase flushing frequency if stagnant, metallic, discoloured or smelly water is noticed in between flushing events. Advise WSD if problem persists	
5. POU devices fitted to drinking taps or connected to the water mains ²⁴	According to supplier's instructions	Inspect and maintain POU devices according to supplier's instructions to ensure proper operation. Mark filter cartridge expiry dates on the casings and replace cartridges accordingly Flush water dispensers according to supplier's instructions or Department of Health's health advice. ²⁵			Ask supplier or qualified technician to repair POU devices if necessary. Mark filter cartridge expiry dates on the casings and replace cartridges accordingly	
6. Wall-mounted dispensers	As required	Flush wall-mounted dispensers and the inlet pipes regularly according to the drinking habit e.g. conduct flushing before breakfast if the wall-mounted dispenser is idle after dinner until morning.			Set up regular flushing programme and implement flushing	
7. Strainers in at least one water tap and shower head of each floor/ward	Quarterly, or according to supplier's instructions	The strainers in at least one water tap (e.g. the sentinel taps) and shower head of each floor/ward are inspected. Confirm that there is no excessive buildup of deposits or scales.			Check strainers of other taps and shower heads of the floor/ward. Arrange cleaning or replacement of the strainers if necessary	
8. Hot water devices (e.g. central heat exchanger or storage type water heaters, thermostatic mixing valves, etc.)	Monthly or more frequent as required	The hot water devices operate at 60°C or above, and the water temperature at the hot water sentinel taps is not lower than 55°C (Caution: To prevent accidental scalding, the hot water temperature at the tap outlets used by patients with decreased self-caring ability should not be higher than 43°C).			Adjust the operation temperature of the hot water devices. Arrange maintenance if the temperature cannot be suitably adjusted	
	Monthly or more frequent as required	Confirm that the water temperature at hot water inlet to thermostatic mixing valves is not lower than 55°C, and that at the water outlet is not higher than 43°C (if applicable).			Adjust the operation temperature of the thermostatic mixing valves. Arrange maintenance if the temperature cannot be suitably adjusted	
	Annually, or according to supplier's instructions	Inspect and maintain the hot water devices according to the supplier's recommendations. Engage appropriate maintenance technician to carry out the tasks if required.			Arrange inspection and maintenance of hot water devices	
9. Notification or advice on notice board	Monthly or as required	Check if updated versions of the following notification or advice, if appropriate, are available to water users through notice board or other means: i. Flushing advice after long stagnation, e.g. after long vacancy. ²⁶ ii. Do not take water from hot water tap for drinking water purpose. iii. Any scheduled/non-scheduled suspension of water supply. Flushing of taps for at least 2 minutes before use upon resumption of water supply. iv. Refer to WSD's "Water Use Tips" if necessary. ²⁷			Update any notification provided on plumbing and inside services	

²⁴ Please refer to WSD's "Technical Requirement for Plumbing Works in Buildings" for the requirements of backflow prevention devices for water dispensers (<https://www.wsd.gov.hk/en/plumbing-engineering/requirements-for-plumbing-installation/technical-requirements-for-plumbing-works-in-bldgs/index.html>).

²⁵ Department of Health's "Health Advice on Using Water Dispensers" is available via: https://www.chp.gov.hk/files/pdf/guidelines_on_use_of_drink_fountain_public.pdf

²⁶ Typical flushing advice is available via: http://www.wsd.gov.hk/filemanager/en/share/pdf/tips_to_reduce_lead_intake_e.pdf

²⁷ WSD's Water Use Tips is available via: <https://www.wsd.gov.hk/en/core-businesses/water-quality/water-use-tips/index.html>

Table II. Routine checking/inspection by the Qualified Person (such as Licensed Plumber)

Location	Frequency	Item to check/action to be completed/target to be achieved	Observations	Action completed [sign and date]	Corrective action to take if target is not achieved	Corrective actions completed [sign and date]
1. Water storage tanks (sump tank, roof tank, header tank or any other storage tanks)	Annually	Potable water roof (header) tank levels are set to provide sufficient water pressure and level switch top up control is functioning correctly			Adjust level settings if required and make any necessary repairs	
2. Water pumps (sump pumps or booster pumps)		Pump pressure set points are correctly adjusted to provide sufficient water pressure and the pressure measurement devices and pumps are functioning correctly			Adjust pressure settings if required and make any necessary repairs	
		Pressure set points for the potable water are at higher pressure (typically by at least 50 kPa, if feasible) than for non-potable water (where applicable)				
		Maintain pumps as recommended by the supplier			Replace badly worn parts in good time so that the pump doesn't fail resulting in a loss of pressure	
		Check for any parts being badly worn				
3. Pressure reducing valves		Pressure reducing valve set points are correctly adjusted to provide sufficient water pressure and the pressure measurement devices are functioning correctly			Adjust pressure settings if required and make any necessary repairs	
		Pressure set points for the potable water are at higher pressure (typically by at least 5 m or 50 kPa, if feasible) than for non-potable water (where applicable)				
4. Water meters		Backflow prevention devices are in place as required under the WSD requirements and are found to be functioning correctly ²⁸			Install backflow prevention devices if missing and replace any faulty backflow prevention devices	
5. Pipes, joints and fittings		Confirm that there are no cross-connections at the main plants that could lead to non-potable water (where applicable) flowing from potable water fittings by conducting checks such as flow tests			Remove any cross-connections if identified	

²⁸ It may not be feasible to check whether the backflow prevention devices are functioning if the water supply system is on line.