Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust

DBTH Water Safety Plan Operations and Procedures Manual (WSP/Tech)

This is a new procedural document. It should be used with CORP/HSFS 36 A v.1 – Water Safety Policy: Governance Policy

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Amendment Form

Please record brief details of the changes made alongside the next version number. If the procedural document has been reviewed **without change**, this information will still need to be recorded although the version number will remain the same.

Version	Date Issued	Brief Summary of Changes	Author
Version 1	March 2022	This is a new procedural document, please read in full	Peter Gunn, Authorising Engineer (Water) Matt Gleadall, Head of Estates

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1 INTRODUCTION

The management of water safety is defined in the Doncaster & Bassetlaw Teaching Hospitals NHS Foundation Trust [hereinafter referred to as the "Trust"] 'Water Safety Plan Governance Policy'.

The policy details the roles and responsibilities and communication pathways for those involved in water safety. The policy details governance and compliance requirements, including the competency requirements for contractors and approaches and methods required for risk assessments.

The ''Water Safety Plan Operations and Procedures Manual' is an accompanying document to the Water Safety Policy, providing practical and technical procedural guidance.

2 PURPOSE

The 'Operation and Maintenance Procedures Manual' forms part of the Trust's Water Safety Plan. Herein this document is referred to as 'WSP/Tech'. The WSP/Tech defines the design, operation, management and monitoring of risk systems reported in the Trust written risk assessments for Doncaster Royal Infirmary, Bassetlaw District General Hospital and Montagu Hospital.

The contents and actions described within this manual come together to assist in the mitigation of risk associated with bacterial contamination of water distribution systems and associated equipment.

The WSP/Tech defines the need to complete:

- Routine monitoring of water systems, including the keeping of adequate records;
- Sampling and testing plans of water systems;
- Remedial actions to water systems to remedy high sample counts;
- Routine cleaning and descaling of water outlets and associated equipment.

3 DUTIES AND RESPONSIBILITIES

The WSP/Tech has been prepared by the members of the Trust's Water Safety Group (WSG). The WSG will review the procedures annually.

The WSP/Tech is implemented by the Trust's Director of Estates and Facilities (Responsible Person (RP) [Water]). Support is provided by the following:

Deputy Director of Estates and Facilities – Deputy RP [Water]
Head of Estates – Authorised Person [Water]
Estates Manager (Mechanical) DRI/MMH – Deputy AP [Water]
Estates Manager BDGH – Deputy AP [Water]

Any further duties and responsibilities associated with the direct completion of tasks within the WSP/Tech are contained within the main body of the document.

4 PROCEDURES

4.1 Management

4.1.1 Control Strategy

The following water treatment strategies are used to control the proliferation of water borne pathogens in Trust properties:

Site	Building / Block	Temperature	ClO2	CuAg
Doncaster Royal Infirmary	Throughout site areas	✓		✓
Bassetlaw District General Hospital	Throughout site areas	✓		✓
Montague Hospital	Throughout site areas	✓		✓

Temperature Control

- Domestic hot water storage is set to 60^{O}C, with a return of 55^{O}C.
- Domestic cold water storage is less than 20^{O}C.

A single proprietary method of control in the form of Copper Silver ionisation has been installed at all three main Trust sites as follows:-

Doncaster Royal Infirmary
2No. Silver Copper [CuAg] ionisation units at DRI are maintained by Contractor [ProEconomy]

1. Main raw unit is housed in SUB 1 Building (DRI28, L02, R0004)
2. Main softened unit is housed in SUB 1 Building (DRI28, L02, R0004)

Unit 1 injects directly in to the main raw feed from Yorkshire Water after the renal connection.
Unit 2 injects directly in to the softened supply to site.

Areas not covered by the CuAg system are listed below:-

- Carousel (DRI 08)
- Aurora (DRI 11)
- Renal RO unit (DRI26)

ProEconomy undertake a monthly site visit to carry out PPM checks on the systems, check the CuAg levels, then undertake 20No. adhoc Legionella samples across the site.

All PPM records and Legionella results then recorded on the ProEconomy web portal 'Tetras'.

Bassetlaw District General Hospital
3No. Silver Copper [CuAg] ionisation units at BDGH are maintained by Contractor [ProEconomy]

1. Main raw unit is housed in SUB 1 Building (BDG10, L02, R0004)
2. Main softened unit is housed in SUB 1 Building (BDG10, L02, R0004)
3. Phase 2a softened unit is housed in Phase 2a lower plantroom (BDG50, L01, R0043)

Units 1 & 2 inject directly in to the main raw feed from Severn Trent Water and the main softened feed. These then go on to feed the whole site with some exceptions.

Areas not covered by the CuAg system are listed below.

- Hillside (BDG01)
- Houses and Flats (BDG02,03)
- Sunshine Nursery (BDG57)
- Kilton Blocks (BDG06,07,08)
- Workshops (BDG13)
- Estates Office (BDG13)
- Medical Records (BDG16)

Areas with CuAg softened supply only

- Mortuary (BDG25)
- Dietetics Dept. (BDG26)

Unit 3 injects into Phase 2a softened water supply. *(Water softeners strip silver/copper from water supplies, therefore a small system has been installed post phase 2a softener to bring silver/copper levels back up to levels supplied by Unit 1).*

ProEconomy undertake a monthly site visit to carry out PPM checks on the systems, check the CuAg levels, then undertake 10No. adhoc Legionella samples across the site.

All PPM records and Legionella results then recorded on the ProEconomy web portal 'Tetras'.

Montagu Hospital
A single Silver Copper [CuAg] ionisation unit at MH is maintained by Contractor [ProEconomy]

1. Main raw unit is housed in the pump lodge at the rear of MMH09.

Unit 1 injects directly in to the main feed from the tank, then feeds the whole site.
Areas not covered by the CuAg system are listed below.

- Dental

ProEconomy undertake a monthly site visit to carry out PPM checks to the system, check the CuAg levels, and then undertake 10No. adhoc Legionella samples across the site.
All PPM records and Legionella results then recorded on the ProEconomy web portal 'Tetras'.

RAMS for all CUAG systems can be found within Appendix 3

4.1.2 Summary of Trust Risk Systems and Components

The attached spreadsheet [see below] is the summary of all the risk systems and components identified from the risk assessments. The contents of the WSP/Tech are based on these systems:

Hard copies located centrally within Trust Estates Dept's Master copy located on MiCAD system.

4.1.3 Water Supplies

4.1.3.1 Private Water Supplies

Natural water sources such as borehole supplies may be contaminated with Legionella. A borehole is present at the 3 hospital sites, although these are all currently decommissioned. There are no plans to return to a borehole supply. In the event these plans change, this water supply will be subject the requirements of the Private Water Supply Regulations 2016. Additionally, the water supply will be subject to risk assessment by the local authority to determine the quality of the water supply. The quality of the water supply may require some form of treatment i.e., CL02, UV, etc.

The Trust will ensure a risk assessment is completed of the private water supply and adequate provisions are made to ensure the quality of the water and that this quality is monitored routinely.

4.1.3.2 Drinking Water Systems

The design of storage systems, pipework, valve arrangements and other fittings used on the system shall be such that they do not allow the contamination of the drinking water systems which could encourage microbial multiplication. These systems shall be configured in accordance with:

- Water Supply (Water Fittings) Regulations 1999;
- BS EN 806 & 8558
- Water Fittings & Materials Directory.

The Trust will endeavour to ensure all pipework carrying fluids which are NON drinking will ideally be labelled according to British Standard, in-particular for all new installations. This action will assist in avoiding possible cross connections between installations conveying drinking and non-drinking water or water from private supplies.

Lead free materials for formation of capillary joints of domestic water systems must be used.

Vending machines, ice machines, cold water dispensers and high pressure jet hoses must all be fed from a drinking water supply with suitable back flow prevention device installed.

Treatment system used on drinking systems must not cause a breach of the requirements of the Water Supply (Water Quality) Regulations 2000.

Wet fire protection systems i.e., hoses, sprinklers, wet risers will be isolated from any drinking water supply by a method which is permissible by the Water Supply (Water Fittings) Regulations 1999.

These supplies when feed from a drinking supply are very rarely used, stagnation occurs and conditions prevail which encourage microbial multiplication.

Accepting the Trust provide a potable water supply to individual 3rd party occupied areas, effective water safety management locally at the point of supply, remains the responsibility of the occupier. To this end, evidence will be provided to the Trust WSG on request [at least annually].

4.1.3.3 Non Drinking Water Systems

Rain water, surface runoff water, private water supplies, drainage of foul water, emergency use water tanks are classed as non-drinking water supplies and as such a potential source of pathogenic contamination. All non-drinking water systems should be colour coded or labelled as such. Rainwater Harvesting will not be considered for use by the Trust in accordance with HTM04-01.

Emergency use water tanks to be kept isolated from other water systems (drinking and non-drinking), by a suitable means which prevents back flow and microbial contamination.

4.1.4 Water Sampling

Water sampling can include legionella, *Pseudomonas aeruginosa* and / or Total Viable Cell Count [TVCC]. Sampling is undertaken to assess the effectiveness of control strategies employed by the Trust to manage the risk of bacterial growth within domestic water systems.

The Infection Control Team will be advised of all water samples taken and reasons for the sampling. All sampling results will be sent to the members of Estates / IPC. Actioning of sample results shall be completed in accordance with the flow charts shown later in this document and within HTM04-01. Progress will be routinely discussed within the Water Safety Group [WSG].

4.1.4.1 Laboratory Competence for Sample Analysis

Samples for Legionella & *Pseudomonas aeruginosa* shall be tested by a UKAS accredited laboratory that takes part in the PHE 'External Quality Assessment' scheme.

For *Pseudomonas aeruginosa* samples labs should follow the appendix F of *HTM04:01 Safe Water in healthcare premises, Part B: Operational Management.* Confirmation must be sought that the chosen lab are following this guidance, namely filtration methods validated using BS EN ISO 17994 and BS EN ISO 16266.

4.1.5 Total Viable Cell Count [TVCC] Sampling Criteria

Routine microbiological monitoring / sampling of hot and cold water systems is not necessary since systems will be supplied with water that is fit to drink.

Circumstances under which samples for general microbiological testing i.e., total aerobic bacterial counts at 37^{o}C, coliforms and E.coli will be taken for the following reasons:-

- One week following handover of a new building or water system, [2-7 days post event];
- As part of the tank cleaning and disinfection process on an adhoc/investigative basis [2-7 days post event];
- In response to taste or odour or sustained discoloured water complaints.

When such samples are taken, a mains supply sample should be taken as a control, to verify whether the supply could be the source of any identified problems. The water supplier is also contacted for distribution zone water quality data, for the same reason. The ICO [W] will certify the sample results are of a drinking water quality before the system is brought back into service/based on local risk assessment.

4.1.5.1 TVCC Sample Result Actions for Potable Quality

Occupant Susceptibility Category:	Where from:	Count above which action required: [cfu / 100 ml]	Required action:
VERY HIGH DRI – Ward 26/27, Ward 18 [Haematology], Ward 32, Ward 28, CDU [birthing pool], Adhoc other areas BDH - ICU, Labour ward [Birthing pool] MH – Adhoc areas via CuAg contract	Representative outlets as agreed by WSG	TVCC = >50 *E.coli* = >0 Coliforms = >0	a) If limited outlets give TVCC counts of 50-100 then re-sample at once. If similar results from second sample then disinfect tank and system. b) If more than 20% of outlets give TVCC counts 50+ disinfect at once, and review procedures. c) If TVCC results give counts >500 sample the mains cold water unit a clear result is achieved. Then sample the cold water storage tanks If these results are clean then no further action. If the results are returned positive then clean the cold water storage tank. d) If any outlet returns *E.coli* or coliforms of >0 disinfect.
SIGNIFICANT ***All other Healthcare areas***	Outlets as agreed by WSG	TVCC = >100 E.coli = >0 Coliforms = >0	a) If limited outlets give TVCC counts of >100 = Re-sample at once, and disinfect if repeated again. b) If more than 40% of outlets give TVCC counts 100+ disinfect at once, and review procedures. c) If TVCC results give counts >500 sample the mains cold water until a clear result is achieved. Then sample the cold water storage tanks. If these results are clean then no further action. If the results are returned positive then clean the cold water storage tank. d) If any outlet returns *E.coli* or coliforms of >0 disinfect.
LOW ***Staff areas***	Outlets as agreed by WSG	TVCC = >150 E.coli = >0 Coliforms = >0	a) If limited outlets give TVCC counts of >150 = Re-sample at once, and disinfect if repeated again. b) If more than 40% of outlets give TVCC counts 150+ disinfect at once, and review procedures. c) If TVCC results give counts >500 sample the mains cold water until a clear result is achieved. Then sample the cold water storage tanks If these results are clean then no further action. If the results are returned positive then clean the cold water storage tank. d) If any outlet returns *E.coli* or coliforms of >0 disinfect.

4.1.6 Legionella Sampling Criteria

Samples for Legionella testing are taken:-

1. Monthly from water systems treated with a biocide.
2. At an agreed frequency from water systems where control levels of the treatment regime, i.e., temperature, biocides / alternative technology are not consistently achieved – these samples should be taken until the system is brought back under control [in conjunction with and dependent upon other contingency measures i.e., POU filters and within WSG framework];
3. When an outbreak is suspected or has been identified;
4. 6 monthly where a department specialises with services for 'high risk' patients [see table below for such areas]
5. Prior to handover of:

5.1 Any refurbished area / ward, alteration to an area / ward [samples limited to those outlets included in the work only];

5.2 Any new water storage system [hot or cold];

5.3 Any new building and water storage system [hot or cold] – to be completed by the building contractor.

The Infection Control Team has identified the following areas as "high risk" patients:-

Site	Area	Outlets
DRI	Dept of Critical Care, Women & Children's dept birthing pool, Neo Natal dept., Renal [Ward 32], Respiratory Unit [Wards 21/21], Haematology Ward [Mallard ward], Other areas as identified	As agreed by WSG
BDH	ITU, SCBU, B3 Ward, Labour ward [Birthing pool], Other areas as identified	As agreed by WSG
MH	Other areas as identified	As agreed by WSG

The above designated 'high risk areas' were correct at the time of writing. Designated 'high risk areas' remain under quarterly review within WSG agenda.

Any outlet with a positive sample returned will follow the approved Estates Standard Operating Procedure for Action Following Positive Legionella Sample Results as follows:-

ESOP 021 Action Following Positive L

Note: Embedded document – contact Estates department for a copy of these documents if viewing as a pdf.

When taking samples for Legionella the following criteria will be followed where possible:

Criteria (as numbered above)	Incoming MCW	Sentinel Outlets	Pre-assigned outlets	20% sample / year	All Outlets	DHW generators	CWS tanks
1	✓	✓		✓			
2	✓		✓			✓	✓
3	✓				✓	✓	✓
4	✓	✓	✓				
5.1	✓				✓		
5.2	✓					✓	✓
5.3	✓				✓	✓	✓

Samples will ideally be taken from outlets without a mixer / TMV fitted in order to illustrate whether the problem is isolated to the hot or cold system, or is common to both.

4.1.6.1 Sample Type

Dip sample:
When completing a dip sample the sampler will either use a pair disposable gloves [new pair to warn for each occasion] or sample to disinfect their hands for each occasion [using a 70% v/v ethanol and water or 70% propan-2-ol and water]. Sample bottles should be kept clean, dry and dust free, if there is doubt about the condition of the outside of the sample bottle it should discarded or the outside of it wiped down using a 70% v/v ethanol and water or 70% propan-2-ol and water.

Pre flush sample:
Shall be taken [regardless of sampling for Legionella or bacteriological]. The outlet will **not** be disinfected prior to taking the sample. The sample of water will be taken without letting any water run to waste. [This type of sample is most representative of the risk to individuals and is the only sample that should need to be taken from systems where there is evidence of adequate, sustained control and low risk].

Post flush samples:
Shall be taken regardless of sampling for Legionella or TVCC. If a post flush sample is being taken with no pre-flush sample then a litre of water needs to be flushed from the outlet.

Any fitting i.e., anti-splash device or spray nozzle removed. Whilst wearing protective goggles, a flexible plastic Pasteur pipette, wash bottle or other appropriate means should be used to inject disinfectant [using a 70% v/v ethanol and water or 70% propan-2-ol and water]. Inside the nozzle of the tap until it runs out. Two minutes should be allowed for the disinfectant process to take place. The tap should be turned on and water run to waste to ensure all residual disinfectant is removed and all disinfected water flushed out of the outlet, typically 30 s to 60 s. When this has taken place and without adjusting the flow of water, the sample container should be filed almost to the top just leaving a small air gap.

Flaming method is not to be used.

4.1.6.2 Sample Bottles / Containers

- Only sterile bottles should be used that have been provided by the laboratory.
- Bottles should not be opened until the sample is to be taken.
- Bottles should have the following information.
- Batch code;
- Date of expiry;
- Bottles should ideally be used within 3 months of being sterilised.
- Any bottles outside of the 'Date of Expiry' should be returned to the laboratory who supplied them.
- Bottles should be stored in clean and dry locations.
- Bottles should be adequately labelled with the following:
- Reference number;
- Date & time of sampling;
- Exact location of sampling point;
- Type of water being sampled;
- Reason for taking sample;
- Whether pre or post flush sample;
- Temperature of the water;
- Type of outlet;
- Identity of person taking sample;
- Corresponding paperwork must be completed for each sample taken containing the same information as above.
- Corresponding paperwork may also contain the following information:
  - Sufficient detail to enable sample to be taken from the same location;
  - Unusual features when taking the sample, i.e., smell, appearance or flow rates.

4.1.6.3 Sampling Process

- Samples only to be taken using an un-tampered sterile bottle.
- When taking samples, the bottle is held in one hand and the bottle cap removed with the other hand, ensuring the top or the neck of the bottle doesn't come in contact with hands or the outlet.
- Do not rinse out the bottle or the cap.
- Do not place the cap on any surface; it should remain in your fingers.
- Turn on the water so a gentle stream is flowing, fill the bottle leaving a small air gap between the top of the bottle and the tap, do not allow the top of the bottle to touch the tap and do not all allow the water to over flow out of the bottle.
- Replace bottle cap immediately taking care not to touch the top or the neck of the bottle.

Sampling water from a shower:

- Following the same process as detailed above;

- Cut the end or a corner off a new food grade plastic bag. Insert the shower head into the plastic bag and hold the bag closed around the shower hose behind the shower head. Insert the other end of the bag into the open sample container;
- Keeping the bag closed behind the shower head [a rubber band may be used to facilitate this] carefully turn on the water flow so that a gentle flow is created and the water flows into the container;
- Alternatively remove the shower head, being careful not to lose any water that be in the shower head, and collect the sample from the shower hose – this method must be noted on the paperwork.

If during sampling accidental contamination is suspect the sample should be discarded and a fresh sterile bottle used to take a new sample.

4.1.6.4 Sample Transportation

The bottle should then be placed into a cool, dark, insulated container for transporting to the laboratory [see below for more detail].

Sample delivery times to the laboratory:-

- Legionella samples ideally within 24 hours but should not exceed 48 hours;
- Bacteriological samples within 24 hours.

Transportation of sample:-

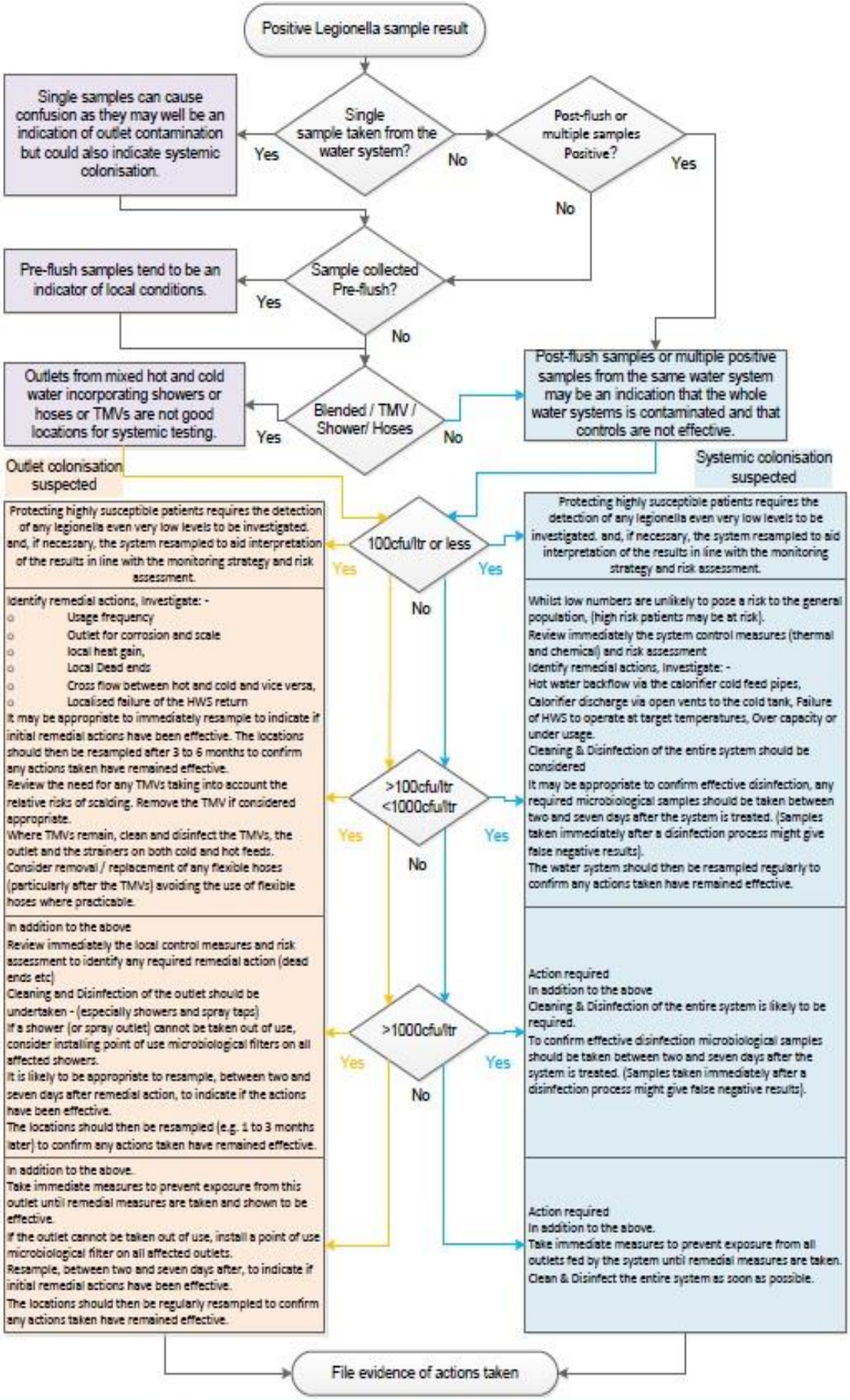
- Hot and cold samples to be packaged separately;
- Samples should be protected from heat and sunlight, kept at ambient temperature not exceeding $20^{O}C$;
- Bacteriological samples should be kept at $2\text{-}8^{O}C$.

4.1.6.5 Legionella Sample Result Action Levels Flow Chart

Legionella bacteria (cfu/l)	**Results from Pre-flush samples** Pre-flush samples tend to be an indicator of local conditions and if detected will often require Post-flush samples in order to determine that the contamination is local and not systemic.	**Systemic results (Post-flush samples)** Post-flush samples (or multiple positive samples) may be an indication that the whole water systems is contaminated and that controls are not effective
Legionella not detected	Continue with current control scheme	
Legionella from detection to 100	ACTION REQUIRED: The detection limit for Legionella by culture methods was historically 100cfu/L, at present laboratories may be able to report to levels of 20cfu/L or less. This can cause confusion over what level should bring about corrective actions. The primary concern is protecting susceptible patients, so any detection of legionella should be investigated and, if necessary, the system resampled to aid interpretation of the results in line with the monitoring strategy and risk assessment	

100 – less than 1000	ACTION REQUIRED:
	• Identify remedial actions, Investigate:
	  ○ Usage frequency;
	  ○ Outlet for corrosion and scale;
	  ○ Local heat gain;
	  ○ Local Dead ends;
	  ○ Cross flow between hot and cold and vice versa;
	  ○ Localised failure of the HWS return
	• Immediately resample to indicate if initial remedial actions have been effective. The locations should then be resampled weekly until 3 consecutive weeks of clear samples, followed my monthly samples with 3 months of consecutive clean samples.
	In addition to the above, and if the outlet is served by a TMV:
	• Review the need for the TMV taking into account the relative risks of scalding. Remove the TMV if considered appropriate;
	• If the TMV is to remain, clean and disinfect the TMV, the outlet and the strainers on both cold and hot feeds;
	• Identify any flexible hoses (particularly after the TMV) and consider replacement, avoiding the use of flexible hoses where practicable.
		ACTION REQUIRED:
		Whilst low numbers are unlikely to pose a risk to the general population,
		• Review immediately the system control measures and risk assessment;
		• Identify remedial actions, Investigate: -
		  ○ Check for any hot water backflow via the calorifier cold feed pipes
		  ○ Calorifier discharge via open vents to the cold tank.
		  ○ Failure of HWS to operate at target temperatures
		  ○ Over capacity or under usage
		• Cleaning & Disinfection of the entire system should be considered
		• It may be appropriate to confirm effective disinfection, any required microbiological samples should be taken between two and seven days after the system is treated. (Samples taken immediately after a disinfection process might give false negative results).
		• The locations should then be resampled weekly until 3 consecutive weeks of clear samples, followed my monthly samples with 3 months of consecutive clean samples.

1000-10,000	ACTION REQUIRED: • Call extraordinary WSG meeting to review actions below • In addition to the 10 – less than 1000 actions; • Installation of point of use filters on all effected outlets; • Review immediately the local control measures and risk assessment to identify any required remedial action (dead ends etc); • Cleaning and Disinfection of the outlet should be undertaken – (especially showers and spray taps); • If a shower (spray outlet) cannot be taken out of use, consider installing point of use microbiological filters on all affected showers; • It is likely to be appropriate to resample, between two and seven days after, to indicate if initial remedial actions have been effective. • The locations should then be resampled as above.	ACTION REQUIRED: • Call extraordinary WSG meeting to review actions below • In addition to the 10 – less than 1000 actions; • Installation of point of use filters; • Cleaning & Disinfection of the entire system is likely to be required; • To confirm effective disinfection microbiological samples should be taken between two and seven days after the system is treated. (Samples taken immediately after a disinfection process might give false negative results). • Samples to continue as above.
>10,000	ACTION REQUIRED: • In addition to the 1000–10000 actions; • Resample within 2 - 7 days post initial remedial action; • Samples to continue as above.	ACTION REQUIRED: • In addition to the 1000–10000 actions; • Clean and disinfect the entire system as soon as possible. • Samples to continue as above.


Positive Legionella sample result
Single samples can cause confusion as they may well be an indication of outlet contamination but could also indicate systemic colonisation.
Single sample taken from the water system?
Yes
No
Post-flush or multiple samples Positive?
Yes
No
Pre-flush samples tend to be an indicator of local conditions.
Sample collected Pre-flush?
Yes
No
Outlets from mixed hot and cold water incorporating showers or hoses or TMVs are not good locations for systemic testing.
Blended / TMV / Shower/ Hoses
Yes
No
Post-flush samples or multiple positive samples from the same water system may be an indication that the whole water systems is contaminated and that controls are not effective.
Outlet colonisation suspected
Systemic colonisation suspected
Protecting highly susceptible patients requires the detection of any legionella even very low levels to be investigated. and, if necessary, the system resampled to aid interpretation of the results in line with the monitoring strategy and risk assessment.
100cfu/ltr or less
Yes
No
Protecting highly susceptible patients requires the detection of any legionella even very low levels to be investigated. and, if necessary, the system resampled to aid interpretation of the results in line with the monitoring strategy and risk assessment.
Identify remedial actions, Investigate: -
Usage frequency
Outlet for corrosion and scale
local heat gain,
Local Dead ends
Cross flow between hot and cold and vice versa,
Localised failure of the HWS return
It may be appropriate to immediately resample to indicate if initial remedial actions have been effective. The locations should then be resampled after 3 to 6 months to confirm any actions taken have remained effective.
Review the need for any TMVs taking into account the relative risks of scalding. Remove the TMV if considered appropriate.
Where TMVs remain, clean and disinfect the TMVs, the outlet and the strainers on both cold and hot feeds.
Consider removal / replacement of any flexible hoses (particularly after the TMVs) avoiding the use of flexible hoses where practicable.
Whilst low numbers are unlikely to pose a risk to the general population, (high risk patients may be at risk).
Review immediately the system control measures (thermal and chemical) and risk assessment
Identify remedial actions, Investigate: -
Hot water backflow via the calorifier cold feed pipes,
Calorifier discharge via open vents to the cold tank, Failure of HWS to operate at target temperatures, Over capacity or under usage.
Cleaning & Disinfection of the entire system should be considered
>100cfu/ltr <1000cfu/ltr
Yes
No
It may be appropriate to confirm effective disinfection, any required microbiological samples should be taken between two and seven days after the system is treated. (Samples taken immediately after a disinfection process might give false negative results).
The water system should then be resampled regularly to confirm any actions taken have remained effective.
In addition to the above
Review immediately the local control measures and risk assessment to identify any required remedial action (dead ends etc)
Cleaning and Disinfection of the outlet should be undertaken - (especially showers and spray taps)
If a shower (or spray outlet) cannot be taken out of use, consider installing point of use microbiological filters on all affected showers.
It is likely to be appropriate to resample, between two and seven days after remedial action, to indicate if the actions have been effective.
The locations should then be resampled (e.g. 1 to 3 months later) to confirm any actions taken have remained effective.
>1000cfu/ltr
Yes
No
Action required
In addition to the above
Cleaning & Disinfection of the entire system is likely to be required.
To confirm effective disinfection microbiological samples should be taken between two and seven days after the system is treated. (Samples taken immediately after a disinfection process might give false negative results).
In addition to the above.
Take immediate measures to prevent exposure from this outlet until remedial measures are taken and shown to be effective.
If the outlet cannot be taken out of use, install a point of use microbiological filter on all affected outlets.
Resample, between two and seven days after, to indicate if initial remedial actions have been effective.
The locations should then be regularly resampled to confirm any actions taken have remained effective.
Action required
In addition to the above.
Take immediate measures to prevent exposure from all outlets fed by the system until remedial measures are taken.
Clean & Disinfect the entire system as soon as possible.
File evidence of actions taken

4.1.6.6 Reporting Results for TVCC & Legionella

Results are reported from the lab via phone / email to the following persons:

- AP [W] / DAP's [W]
- ICO [W]
- Infection Control Nurse

The RP [W], DRP [W] via the AP [W] DAP's [W] and ICO [W] will review the results in line with the action tables shown above and assign actions accordingly.

An extraordinary WSG may be convened to ensure actions are taken accordingly.

4.1.7 Pseudomonas aeruginosa Sampling Criteria

Experience has shown no correlation between TVCCs & *Pseudomonas aeruginosa.* There is no need for TVCC or Pseudomonas species samples to be done routinely in parallel with *Pseudomonas aeruginosa* sampling.

Sampling for *Pseudomonas aeruginosa* will be undertaken at identified outlets in augmented care units once every 6 months, these outlets will be identified by the Infection Control Team based on:

1. Outlets which supply water that has direct contact with patients;
2. Is used by staff to wash hands;
3. Used to clean equipment that will have contact with patient (as determined by risk assessment);

The Infection Control Team has identified the following areas which will require sampling and monitoring:

The Infection Control Team has identified the following areas as "high risk" patients:

Site	Area	Outlets
DRI	Dept of Critical Care, Women & Children's dept birthing pool, Neo Natal dept., Renal [Ward 32], Respiratory Unit [Wards 21/21], Haematology Ward [Mallard ward], Other areas as identified	As agreed by WSG
BDH	ITU, SCBU, B3 Ward, Labour ward [Birthing pool], Other areas as identified	As agreed by WSG
MH	Other areas as identified	As agreed by WSG

The above designated 'high risk areas' were correct at the time of writing. Designated 'high risk areas' remain under quarterly review within WSG agenda.

Any outlet with a positive sample returned will follow the approved Estates Standard Operating Procedure for Action Following Positive Pseudomonas Sample Results as follows;

ESOP 007 Action Following Positive P

Note: Embedded document – contact Estates department for a copy of these documents if viewing as a pdf

When designing the sampling plan for an area the outlets to be sampled should be programmed so a selection of outlets are sampled in one batch in one week and then more outlets sampled in another batch the following week. This will ensure all outlets in an area are sampled around the same time but without limiting the use of outlets in an area / dept. by sampling all the outlets at the same time.

4.1.7.1 Sample Type

Where an outlet is to be sampled for the first time i.e., a new outlet as part of the strategy then this outlet shall be sampled pre and post flush [as previously detailed].

Samples for *Pseudomonas aeruginosa* shall be from the identified outlets every 6 months, this sample will be a pre flush sample only. Where an outlet is returned with a positive sample result the subsequent samples shall be pre and post flush [as previously detailed].

4.1.7.2 Sampling Process for Pseudomonas aeruginosa

Samples taken for *Pseudomonas aeruginosa* will follow the plan below:

- Samples will only be collected by trained individuals.
- Samples only to be taken using an un-tampered sterile bottle.
- Single use disposable gloves are to be worn. A new pair will be worn for each sample taken and disposed of immediately after the sample has been taken. The disposable gloves shall be kept in their original supplied packaging until the time when they are required [ensure the user is not sensitive to the disposable gloves supplied].
- All samples to be taken aseptically (i.e., without touching the screw thread of the sample bottle, without touching the inside of the cap of the sample bottle and without touching the inside of the sample bottle).
- All samples will be taken using 200-500ml sterile bottles with a neutralizing agent already added to the bottle.

- Those outlets being sampled where the water has been treated with ClO2 should be collected using sample bottle dosed with 18mg of sodium thiosulphate.
- Each sample will be recorded using record keeping form [see appendix 2] and the location of the outlet clearly identified on the sampling paper work, including sampler name, date, time, type of sample i.e., pre or post and type of water i.e., hot or cold or mixed.
- The outlet should not be disinfected before sampling (pre or post sample), nor should the outlet be cleaned or disinfected immediately before sampling.
- Pre flush samples to be taken during periods of no / low use i.e., early in the morning before use / the outlet has not been used for at least 2 hours before drawing the sample.
- Post flush sample – a post flush sample should only be taken when a pre flush sample has returned with *Pseudomonas aeruginosa* present. A post flush sample should be taken following the same aseptic procedure. A post flush sample will be taken after a pre flush sample, allowing the water to flow steady for 2 minutes from the outlet after taking the pre flush sample.
- Sampling from a shower head will require a sterile bag over the head of the shower and using sterile scissors cut a small section off one of the corners and collect the sample.
- Samples to reach the lab within 2hrs; where this is not possible the samples will need to be kept between 2-8 Deg.C. and processed within 24 hrs.

4.1.7.3 Pseudomonas aeruginosa Sample Results Action Levels & Interpretation

Action Levels:

Result	Not Detected [ND]	1-10 cfu/100mL	>10 cfu /100mL
Actions	See Action 1	See Action 2	See Action 3

Interpretation of Results:

Possible combination of at results	**What does it mean?**
High pre flush counts [>10 cfu/100mL] and low post flush count [ND or <10 cfu /100mL]	Suggest local problem with outlet.
High pre flush counts [>10 cfu/100mL] and high post flush count [>10 cfu /100mL]	Suggest problem is more than related to the outlet but wider problem with the water supply system

ACTION 1:

- No further action required at present.
- Sample again in 6 months.

ACTION 2:

- WSG to meet to risk assess the continued use of the outlet on the unit;

- Retest the outlet at 3 days from the date of receiving the original test results [pre & post samples to be taken];
- If the retest result is negative then return the outlet to use and resample again at 6 months.
- If the retest is positive then follow the Action 3 [see below].

ACTION 3:

- Fit of point of use filters as a temporary measure until a permanent safe engineering solution is developed. Filter will be removed when all 3x consecutive retest samples are negative [estates actions].
- Where a positive sample has been returned on the 'retest after 3 days' then estates actions and infection control actions will be completed below.
- Outlet to be resampled following remedial works. If the sample is returned negative, the outlet will be retested 3 days from the date receiving the test result. If this is returned negative the outlet will be retested 2 weeks after the date of the 3 day test was taken. If this is returned negative the outlet will be retested 4 weeks after the date of the 3 day test. If this is returned negative sample the outlet every 6 months.
- Where outlets are taken out of use the outlets should be flushed daily [5 minutes / day] by Trust CP [W] to prevent stagnation, the outlet should continue to be flushed daily.

Estates Actions:

- Check temperature of water supply including storage systems;
- Check outlet for scale – dismantle tap assembly [and TMV if separate] and undertake a local disinfection;
- If shower then replace shower head and hose and TMV;
- Consider removal of flow straighteners – where splashing may result then additional remedial action will be required to prevent splashing. If straighteners are needed then should be cleaned / disinfected or replaced periodically [frequency of which should be verified by sample / swabs]. Splashing of water can disseminate the organism, resulting in an outlet becoming contaminated. The splashing should be investigated, causes can include:

    - Tap design flow is not compatible with basin.
    - Tap discharges directly into waste aperture.
    - Incorrect height between tap outlet and surface of basin.
    - Excess of water pressure.
    - A blocked or malfunctioning flow straightener.

- Check connections to mixing taps to ensure there are no TMVs fitted further upstream supplying the mixing tap.
- Check for cold water deadleg where cold water supplies a TMV.
- Assess the system for blind ends and dead legs. When removing outlets pipes should be cut right back to the main distribution pipework.
- Assess the distribution system for:

- Non-metallic materials i.e., inline valves /filters / strainers, test points and flexible hoses. These should be replaced. Exceptional circumstances such as hi –lo bath and showers will require flexible hoses.
- Use of WRAS materials should be confirmed.

Where disinfection of the distribution system is taken as a control option it should be noted that hyperchlorination is not effective against established biofilm. Consideration for tap replacement with new taps should be reminded that there is a lack of scientific evidence this will be a long term solution, as such consider fitting:

- Removable taps.
- Taps are easy to use.
- Taps be readily dismantled for cleaning and disinfection.
- Taps allow for filter attachment to spout.

Infection Control Team Actions:

- Review use of outlets to confirm if stagnation is an issue within the unit;
- Review housekeeping practices – cleaning of clinical wash-hand basins and taps should be undertaken in a way that does not allow the cross contamination from bacterial source to the tap;
- Rigorous reinforcement of standard infection control practices, including refresher training should be implemented;

Only use the hand wash station for hand washing:

- Do **NOT** dispose of body fluids/secretions at the hand wash station basin – use the dirty utility area;
- Do **NOT** wash any patient equipment in hand wash basins;
- Do **NOT** use hand wash basins for storing used equipment awaiting decontamination;
- Wash patients, including neonates, on augmented care units with water from outlets demonstrated to be safe established by water sampling and risk assessment.
- Do **NOT** dispose of used environmental cleaning fluids at hand wash basins.
- Hand washing should be supplemented with use on antimicrobial hand rub within the unit;
- Alcohol hand rub dispensers should be located at the point of care or use individual hand rub dispensers.
- Bottles of alcohol sanitiser should be pre-filled and should not be topped up.

4.1.7.4 Reporting Results for *Pseudomonas aeruginosa*

Results are reported from the lab via phone / email to the following persons:

- AP [W] / DAP [W]
- ICO [W]
- Infection Control Nurse

The RP [W], DRP [W], AP [W], DAP's [W] and ICO [W] will review the results in line with the action tables shown above and assign actions accordingly.

An extraordinary WSG shall be convened for counts >10cfu/100ml to ensure actions are taken accordingly.

Where a sample of water is sent for analysis in response to a clinical investigation the test laboratory must be informed by the ICO [W] the isolates of *Pseudomonas aeruginosa* and associated sampling location information details should be retained for 3 months as they may be required for typing at a later date. The laboratory will be required to issue the isolates to the typing laboratory when requested.

4.1.7.5 Protection of Augmented Care Patients

The sections detailed below are examples of best practice advice aimed at protecting susceptible patients:

- Water quality should be known where it is used in direct contact with patients;
- Water testing has shown an absence
- Water supplied through a filter
- Sterile water
- Review of outlets where there may be direct or indirect contact with patients, this also includes reviewing the need for removal i.e., showers / outlets;
- Single use wipes for patient use;
- Rigorous reinforcement of standard infection control practices, including re-fresher training should be implemented;
- Cleaning of clinical wash hand basins and taps should be undertaken in such a way that does not allow cross contamination from bacterial source to the tap;
- Cleaning of patient contact equipment [i.e., tap handles, incubators, humidifiers, nebulisers and respiratory equipment] should be reviewed. Options would be:
- Use of single use equipment
- When locally reprocessed [even when used on same patient] equipment is cleaned with water where the quality is known [see 1 above];
- Use of single use detergent wipes cleaning incubators [manufacturers' guidance to be followed]. Disinfectants are NOT to be used when incubator is occupied;
- All other uses of water by patients on augmented care units should be reviewed [i.e., ice machines, drinking water fountains, bottled water dispensers, wet shaving of patients with central venous catheter inserted into the jugular vein and washing patients with indwelling devices].
- Tap water should be used in neonatal units for the process of defrosting frozen breast milk;
- Water features should not be installed in augmented care units;
- All equipment for use with, on or by patients should be kept clean and stored in a dry area away from being splashed;

- All preparation areas for aseptic procedures and drug preparation and any associated sterile equipment should not be located where they are at risk of splashing / contamination from water outlets;
- Those little used outlets identified in an augmented care unit should be flushed daily by the services team [in the morning and for at least one minute]. Those little used outlets with filters fitted should have not filters removed for flushing [unless otherwise instructed by manufacturers' guidance]. Records to be kept of all flushing tasks;
- TMVs are serviced in accordance with this WSP/Tech and records kept;
- Integral TMVs to be considered for taps/showers – these draw cold water through each time the outlet is used as such minimise the risk of cold water stagnation;
- Those taps designed for easy, routine maintenance should be removed for descale and decontamination [frequency of which is determined by sampling];
- Estates to ensure:
- Accurate system drawings are maintained and are updated following modifications;
- All services are labelled for easy identification;
- Staff who undertake installation, removal, replacement of outlets, pipework and fittings are suitably trained to prevent contamination of the water system.

<u>These remain the 'ideal' regarding a sampling strategy and remain a work in progress in conjunction with the WSG.</u>

4.1.8 Routine Monitoring Tasks

4.1.8.1 Thermometers and Calibration

Digital thermometer units with a touch and immersion probes are currently used Trust-wide for taking temperatures.

All new devices [thermometer unit and associated probes [immersion and contact] will be purchased with a UKAS calibration having been completed prior to use. Each device [thermometers and probes] will have a unique identifying reference (e.g., asset number, serial number etc.) for traceability and auditing.

All thermometers and probes held by the Trust are sent to a UKAS accredited laboratory for annual calibration. The 3rd party calibration certificates are retained by the DAP [W].

4.1.8.2 Water Temperature Checks

Temperature checks on the DHW generators / CWS tanks and distribution systems will be carried out as detailed below on a monthly, quarterly, six monthly and annual basis. In the event of a non-compliance, the DAP's [W] shall be informed verbally and via real time on-line notifications. Use of a digital thermometer with a touch and immersion probe is recommended.

Abuilding management system [BMS] remains in place at DRI and which electronically monitors water temperatures i.e., all Cold water storage and Hot water flow/returns. These are checked daily by the site Estates officer [DRI only currently] Cold water storage tank temperatures should be checked during periods of high ambient temperatures [e.g., afternoons between June and August], water temperatures should be no greater than 20°C. At the same time, the furthest and nearest draw off points in the system should be checked to ensure that the water distribution temperatures are less than 20°C within 2 minutes of running the water *[at full flow]*. A similar temperature check regime should be undertaken during the winter months to identify the performance of cold water distribution systems and the impact of heat gain from heating systems.

System/Service	Task	Frequency
Domestic cold water tank	Incoming mains cold water temperature	Annually
	Tank water temperature	Annually
Domestic cold & hot water outlets	Sentinel tap temperatures [mixed & non-mixed]	Monthly
	Sentinel return loops [principle loops]	Monthly*
	Sentinel return loops [sub-ordinate loops]	Quarterly*
	Temperature at representative number of taps / territory return loops on a rotational basis	Annually
DHW Generators	Flow and return temperature	Monthly

*tasks not currently undertaken and remain under review via WSG

4.1.8.3 Hot and cold water sentinel outlet and return loop temperatures:

For domestic hot water services, these are the first and last taps on a re-circulating system. For cold water systems or non-recirculating hot water systems this is the nearest and furthest taps from the storage tank.

For cold water outlets, the temperature should be below **20°C** after 2 minutes of running the water. For hot water outlets, the temperature should reach **55°C** within 1 minute of running the water.

Temperatures at return legs of principal loops [sentinel points] to confirm they are at a minimum of **55°C** within 1 minute. *not currently undertaken

Temperatures at return legs of subordinate loops [but where this is not practicable, the temperature of water from the last outlet on each loop may be measured and this should be greater than **55°C** within one minute of running]. If the temperature rise is slow, it should be confirmed that the outlet is on a long leg and not that the flow and return has failed in that local area. *not currently undertaken

Temperature measurements may be taken on the surface of metallic pipework for return loop monitoring on a case by case basis.

4.1.8.3 Thermostatic mixer valves:

Where fitted, the input temperatures to thermostatic mixer valves should be at least **55°C** within 1 minute of running the water. Outlets with TMV's should be monitored on a sentinel basis as detailed above.

Where water temperatures fail to satisfy the criteria described (see table below), the AP's [W] and DAP's [W] shall be informed, and a full investigation must follow and a reactive task will be logged on the Trust's CAFM system as a priority 2 task (requires attendance within 24 hrs). Details of any action taken to resolve the issue will also be recorded on the CAFM system for future reference.

General Criteria for action in the event of a non-compliance;

Augmented/High risk [DHW >/= 55]	<55	DAP [W] to review / undertake remedial action
H/C – Ideally [DHW >/= 55]	<55 - 50	DAP [W] to review / undertake remedial action
Non H/C [DHW >50]	<50	DAP [W] to review / undertake remedial action
All areas [CWS <20]	<20	DAP [W] to review / undertake remedial action

Table 2 Recommended devices and outlets

Activity/area	Maximum recommended set delivery temperature (°C)	Type of device
Areas where TMV type 3 valves should be fitted		Type 3 thermostatic mixing valve
Showers and hair-wash facilities	41	
Unassisted baths	44	
Baths for assisted bathing	46 – to allow for the cold mass of the bath. NB – prior to patient immersion, water should be checked with a thermometer.	
Bidets	38	

Note: Bath fill temperatures of more than 44°C should only be considered in exceptional circumstances where there are particular difficulties in achieving an adequate bathing temperature. If a temperature of more than 44°C is to be used, then a safe means of preventing access to the hot water should be devised to protect vulnerable patients.

Wash-hand basins and sinks

Wherever wash-hand basins are installed, a mixed water temperature outlet is required: a risk assessment should be undertaken, which is overseen by the WSG, that considers the needs of patients and service-users to determine whether there is a scalding risk and whether additional protection is required (e.g. a type 1 with temperature stop, type 2 or type 3 mixing valve – see options below). **Hazard warning signs for scalding risk should be displayed if appropriate.**

For outlets not intended for hand-washing (e.g. sinks in kitchens, dirty utilities or cleaners' rooms), TMVs should not be installed. **All installations require a hot water hazard warning sign.** (The temperature could equate to the maximum temperature available from the calorifier.)

Note: Microbiological risks should also be considered for all installations.

Options:

1. Separate hot and cold taps

2. Mixed temperature outlet:

- Type 1 – a mechanical mixing valve with or without temperature stop (i.e. manually blended)
- Type 2 – a thermostatic mixing valve: BS EN 1111 and or BS EN 1287
- Type 3 – a thermostatic mixing valve with enhanced performance: HTM 04-01: Supplement – 'Performance specification D 08: thermostatic mixing valves (healthcare premises)'

Type 3 TMVs should have undergone third-party testing and certification to the requirements of HTM 04-01: Supplement – 'Performance specification D 08: thermostatic mixing valves (healthcare premises)'.

Notes:

1. Where installed, it is preferable that thermostatic mixing devices are fitted directly to the mixed temperature outlet or be integral with it, and be the method of temperature and flow control, i.e. the mixing device should not be separate nor supply water via a second tap or manual mixer since there will be many cases where draw-off of cold water will not occur. If a separate thermostatic device is used, it should be fitted as close to the outlet as possible, which should be a flow-only control. Where "T" type mixing valves are installed, they should be readily accessible for maintenance.
2. In the case of bidets with ascending sprays or a handle douche, which may be accidentally immersed, the water supply should be independently fed from storage with no draw-offs at a lower level (i.e. a break-tank arrangement). Appropriate backflow protection must be provided (see paragraphs 12.18–12.24).

3. Automatic taps (timed flow) can be considered as a result of a risk assessment and should be specified as appropriate for the conditions of use, either type 2 or 3. If the temperature is non-user adjustable, they should be supplied via a type 2 or 3 TMV set to 39–40°C. The sensors should include a timer that can be adjusted to take account of the optimum washing time: this is particularly for scrub sinks. Sensors should be offset or positioned such as to reduce the risk of accidental contamination of the outlet and be positioned so that POU filters can be used. Facilities for overriding the sensors will be necessary. When a duty cycle setting exists, it should be activated to avoid stagnation. (If there is more than one tap/outlet, e.g. in the case of scrub sinks, then all should deliver water to avoid stagnation.)
4. In the case of dual-function delivery devices, i.e. bath/shower diverter, type 3 valves should deliver the temperature appropriate to each outlet e.g. bath max 44°C or 46°C, shower 41°C. (Refer also to the commissioning procedure section in HTM 04-01: Supplement – 'Performance specification D 08: thermostatic mixing valves (healthcare premises)'.)
5. Taps, components and fittings should be removable and easily dismantled for cleaning and disinfection.
6. Where manual mixing devices with a temperature stop are installed, it is important to ensure that the normal maximum delivery temperature is controlled to safe limits. Installation, commissioning and maintenance should take account of the system's dynamic pressure and temperature changes, and the seasonal changes in incoming cold water temperatures.
7. This table does not cover birthing pools. (See "Areas this HTM does not cover" in Chapter 1.)

4.1.8.4 DHW generator [PHE/Gas fired water heater/Storage Calorifier] flow and return temps:

To control possible colonisation by waterborne pathogens including Legionella, it is essential to maintain the temperature within the hot water circulating system. To some extent, if properly maintained, the calorifier/water heater will provide a form of barrier to microbial growth. The minimum flow temperature of water leaving the DHW water generator should be 60°C. The minimum water temperature at the connection of the return to the DHW water generator should be 50°C. Hot water circulating pumps should also be of adequate performance to ensure a minimum available temperature at draw-off points of 55°C.

These temperatures will be taken once a month direct from the domestic hot water generator and recorded on the monthly monitoring form. If temperature gauges are not fitted, then suitable surface temperature probes may be used.

4.1.8.5 Incoming mains cold water:

Where there is a cold water storage tank, this should be measured at the ball valve outlet. The water should preferably be below **20°C**. However, during a prolonged hot summer the incoming water may rise above this temperature. Under the Water Supply *[Water Quality]* Regulations, water utilities are permitted to supply water to premises at temperatures up to **25°C**. If incoming water temperatures are above **20°C**, the water supplier should be advised to see if the cause of the high temperature can be found and removed.

Monitoring should ideally be carried out so that one check takes place in the summer months and the other in the winter months.

4.1.8.6 Representative number of taps and tertiary return loops on a rotational basis:

In order to ensure that the whole system is reaching satisfactory temperatures, the outlet temperatures should be taken from 20% of outlets other than sentinel taps. As such all other outlets will have their temperatures monitored once every 5 years. On an annual basis all outlets with a TMV fitted have their temperature monitored and recorded.

For cold water outlets, the temperature should be no greater than 20°C within 2 minutes of running the water. For hot water outlets, the temperature should reach **55°C** within 1 minute of running the water. Where water temperatures fail to satisfy the criteria described, the DAP [W] shall be informed, and a full investigation must follow.

4.1.9 Records

4.1.9.1 Logbook system

The Trust operates an outsourced electronic log-book system [Zetasafe @01/09/19], ensuring that the following minimum requirements are met:

- It is web-based and at all times affords full (controlled) access for Trust staff on a continual 24-hour basis.
- The system uses synchronisation, in real time, with the electronic data logging system used by the field service engineers undertaking water hygiene works to provide current and “real time” data.
- The system allows concurrent multiple user access, allowing both contractor and numerous members of Trust staff to record information. Each user has a unique user name and password to enforce probity requirements and provide audit monitoring information if required.
- A summary page / dashboard enables users to quickly view the progress of water hygiene monitoring against a programme i.e., visits completed / outstanding, completions on faults reported etc.
- An individual electronic ‘log book’ is available for each property.
- The system can alert nominated individual(s) of any overdue monitoring task(s) by e-mail or suitable agreed alternative method.
- The system automatically highlights any non-conformances on the day of inspection.
- The system can alert nominated individual(s) of any non-conformances identified as part of the monitoring regime by e-mail including details of the recommended course of action.
- The system supports photograph uploads to provide evidence of condition on tasks such as cold water storage tank inspections.
- The system can alert specific individuals / groups of non-conformances e.g., faulty calorifier to be sent to maintenance and repair team for action.

- The system automatically generates reports on a monthly basis of all outstanding faults across all sites, e-mailing a copies to nominated individuals
- The system includes a separate page detailing all logged non-conformances for all properties and allow user(s) to add updates on progress, re-allocate to other users for action, re-prioritise and close off once completed. Any non-conformances that have been addressed and closed off should be archived on the system but be available for review if required.
- Lastly, the system complies with the requirements of the Trust's policies on information security & data protection

Monthly compliance report Trust-wide produced and circulated by appointed PPM task contractor.

Following the monthly compliance report issue, a task is then added to Planet FM and referenced on Zetasafe. Estates team will then follow up as required, until non-compliance resolved and or mitigated.

Weekly review of Zetasafe defects by individual Estates Managers once each monthly Biochemica data has been uploaded. Any compliance failures noted by Estates staff will be initially investigated during that working day.

By exception, where the Trust undertakes the PPM task, the following process will be followed;

4.1.9.2 Process for issue and completion of PPM Task

1. PPM's are automatically released through the PLANET FM system
2. The Estates Officers issue the work to staff accordingly.
3. Estates staff carry out the PPM as per instructions.

PASS
The PPM is then completed and closed.
Admin staff will then forward it into approved history.

FAIL
The PPM is then closed as 'follow on work required'
Admin/Estates officers create a follow on work order to rectify any issues.
Estates staff attends and carries out required remedial work.
The work order is then completed and closed.
Admin staff will then forward it into approved history.

4.1.9.3 Incident Reporting

Any non-compliant situation that has been discovered, either as part of routine monitoring or maintenance, is immediately logged on the Trust's CAFM system (Planet FM) as a priority 2 task (requires attendance within 24 hrs). Any such incidents will be logged with a description starting 'Water Safety:' so that details of remedial action taken may be easily identified by filtering data within the CAFM system.

- Non-compliant situations that has been discovered should be logged via an electronic Datix report form using the 'Incident detail' tag 'Water Safety', ensuring that the Water Systems AP or DAP for the corresponding site is assigned as the 'Handler' for the incident report. Examples of situations which would require an incident report completed:
- Identification of little used outlets;
- Issues with temperature of water being reported;
- Inaccuracies found in the RA or schematic;
- Observation of new risk systems not previously reported.

Datix incident reports provide an audit trail that ensures that all non-compliant situations are dealt with and closed down satisfactorily. All Datix incident reports are retained within the system for future audit purposes.

4.1.9.4 Retention Period

The following records will be kept.

Record	Retention Period
WSP - Policy	Throughout the period for which they remain current and for at least two further years.
WSP - Risk assessments & Schematics	
WSP - Risk minimisation scheme and details of its implementation	
WSP – Operation and Maintenance Procedures	
Monitoring, inspection, test and check results, including details of the state of operation of the system.	At least five years

4.1.10 Emergency Situations

4.1.10.1 Legionella Outbreak Actions

The contact details, both during office hours and out-of-hours, of the on-call engineer at all hospital sites are kept at the main switchboard.

An outbreak is defined as two or more cases where the onset of illness is closely linked in time (weeks rather than months) and location and where there is epidemiological evidence of a common source of infection, with or without microbiological evidence.

An outbreak control team should always be convened to investigate outbreaks. It is the responsibility of the Proper Officer to declare an outbreak. The Proper Officer, appointed by the local authority, is often a consultant in communicable disease control (CCDC) within the local PHE centre health protection team.
The Trust will follow the guidance presented in Appendix B of the "Operational Management" volume of HTM.04-01.

The RP [W] will be informed of a suspected case of Legionnaires' disease by the ICO [W]. An investigation will be carried out in association with the PHE and the local Consultant in Communicable Disease Control [CsCDC]:

Public Health England
South Yorkshire Health Protection Team,
Vulcan House Steel,
6 Millsands,
Sheffield,
S3 8NH

Tel: 0114 321 1177
Out of hours advice 0114 304 9843 (ask for public health on-call)

It is essential that systems are not drained or disinfected before samples have been taken.

The investigation will concentrate upon all potential sources of Legionella contamination, including:-

1. Cooling towers;
2. Domestic hot and cold water storage and distribution systems;
3. Showers or spray washing equipment;
4. Drainage systems and traps;
5. Whirlpool baths or hydrotherapy pools;
6. Condensate trays and traps from air conditioning cooling coils;
7. Humidification equipment;
8. Ice-making machines and water coolers.

NOTE: The Trust has no evaporative cooling towers.

The RP [W] will be required to:-

1. Provide details of all pipe layouts and associated equipment;
2. Provide adequate documentation detailing operation and maintenance procedures;
3. Assist the investigation team by locating outlets from which samples can be taken. Easy access to these sampling points is essential;
4. Identify water supplies to medical equipment such as orthodontics, renal dialysis, respiratory therapy;
5. Provide any off-site information e.g., local excavation or earthmoving works, alterations to water supply or drainage systems.

If any relevant legislation has been infringed then the Trust may be subject to a formal investigation by the Police and/or Health and Safety Executive. Once the samples have been taken and the cause of infection identified, it is the responsibility of AP [W] / DAP [W] to commission the disinfection procedures and implement any remedial action.

4.1.10.2 Guidelines for Investigating Single Hospital Cases of Legionnaires' disease

These guidelines have been developed from "Guidelines for investigating single cases of Legionnaires' disease" published in Communicable Disease & Public Health journal Vol. 5 No. 2 June 2002. Authors - JV Lee and C Joseph of the PHE.

These guidelines are produced for Consultants in Communicable Disease Control [CsCDC], microbiologists, clinicians, environmental health officers [EHOs] and other public health specialists involved in the control and prevention of Legionnaires ' disease. It will be the responsibility of the hospital's ICO [W] to lead the investigation into a single case in a hospital, it is essential that the local CsCDC is informed as soon as possible. The hospital's ICO [W] will be responsible for updating this procedure.

Local management of the investigation:-

- Local Memorandum of Understanding [MoU] – this must be agreed between all relevant agencies [HSE, CsCDC, PHE laboratory, Environmental Health Departments].
- Clinical diagnosis of Legionnaires' disease must be supported by confirmed or presumptive microbiological evidence.
- As soon as a laboratory diagnosis has been made by a microbiologist the case should be reported to the local CsCDC and local infectious diseases clerk.
- Investigation to be commenced following the pre-defined MoU. Investigations for Legionella infections may take place outside the residential area of the patient. If this is the case the suspected / confirmed diagnosis result should be immediately sent to the public health department in whose area the patient resides, the local CsCDC can commence follow up procedures.

- The CsCDC to obtain the patient's movements for the two weeks prior to onset of illness. This will include full address and postcode of place residences, place of work, travel details, accommodation details [overnight stays]. This should also include details of possible hospitals visited and other potential common sites and exposure to Legionella.
- All cases should be reported to CsDSC in confidence, via telephone or encrypted fax to a named person. Once clinical, microbiological and exposure histories have been obtained for the case these should be detailed on the standard CsDSC reporting form.
- Investigations specific to hospitals will require reviewing the risk assessment for controlling Legionella and maintenance records by the incident control team in conjunction with the RP [W].
- The review of the risk assessment & maintenance records should identify if there are any deficiencies in controls as detailed by the HSE and NHS guidance. If any such deficiencies in the control are found these should remedied as soon as possible. Any precautionary disinfection of any part of the water system should only be completed after sampling. This sampling will be under the direction of the incident control team and carried out in accordance with BS7592:2008.
- A case search for other confirmed or presumptive cases of Legionnaires' disease associated with the hospital or community should be conducted.

4.1.10.3 Loss of Mains Water

This procedure must be followed in order to minimise risk to patients, staff and the public if any of the following occurs:-

- A cold water main bursts;
- Unplanned loss of supply;
- Contamination of cold water main;
- Suspected contamination of cold water main.

AP [W] / DAP [W] to contact the following if deemed necessary:

- PHE :
  - Telephone 0114 321 1177
  - Out of hours advice 0114 304 9843 (ask for public health on-call)
- Water Utility Company : Yorkshire Water / Severn Trent:
  - Yorkshire Water (DRI/MMH) = 0330 134 33 33
  - Severn Trent (BDGH) = 0800 042 0420 – Customer ID 2000406547
    In the event of a burst water main at any of the Trusts properties it is the intention to use the appropriate Water Utility Company (see list above) to carry out any repairs. It should be noted that they will be working in the capacity of a Contractor to the Trust and as such they will require an appropriate Estates order number. The Water Utility Company will endeavour to undertake sampling on completion of repair under the direction of the PHE.

Following consultation between all parties -

- The ICO [W] will inform the RP [W], AP [W] / DAP [W] of the results of the risk assessment and action to be taken.
- The AP [W] / DAP [W] will be responsible for informing on-site staff of any precautions that need to be taken and keeping staff informed of developments.
- The AP [W] / DAP [W] is to inform the local Fire Authority of any disruption to main water supply as well as any restrictions to the service roads caused by excavation works.

Any decision to put sites on boil notices or bottled water will be made following a risk assessment carried out by the PHE and the Water Utility Company.

In order for the procedure to be effective it is important that continuous liaison is maintained between all parties. A Datix incident report using the 'incident detail' tag 'water safety' shall be completed stating full details.

4.1.10.4 Cold Water Storage Contamination

This procedure is to be implemented if cold water tanks [domestic hot water header tanks or cold water outlet supply tanks] are found to contaminated, which may include:-

1. Back flow failures which may be responsible for tepid cold water [greater than 20^{o}C]:
2. Mixing valve failure causing back feeding - non return valves are recommended;
3. Domestic hot water system venting over the tank;
4. Failure of the primary heating coil;
5. High ambient temperature and heat gain - may be accentuated by poor ventilation, glass windows above tanks, lack of or poor insulation can also be the cause for heat gain on cold water supply;
6. Cross connection of a drinking and non-drinking supply i.e., rain water / surface runoff water system, private water supply or drainage of foul water, such occurrences may not be so obvious to tell at the outlet. Such an occurrence is more likely to be due to an error whilst completing remedial works or installation works;
7. Ingress of vermin, animals or inspects in to the cold water tank.

4.1.10.4.1 Procedure for Actioning Tank Contamination

1. The person identifying, or receiving report of a contamination occurrence must notify the AP [W] / DAP [W] as soon as the problem is identified, and a CP [W] will be identified to be responsible for dealing with the occurrence;
2. The reason for failure must be identified and rectified as soon as possible;

3. Where the occurrence is due to a back flow issue. The CP [W] shall verify the problem by taking the water temperature of the appropriate cold water storage tank. If the cold water storage temperature is greater than 20°C, the temperature of the incoming mains cold water should be taken;
4. If the incoming water is 19°C or greater, and the tank water is no greater than 2°C higher, no actions are necessary. If, the incoming water exceeds 25°C [the AP [W] will contact the Water Supplier];
5. If the water temperature in the tank is greater than 2°C higher than the incoming water supply, the following actions should be implemented;
6. If the reason for warm water is found to be due to ingress of hot water [i.e., from DHW system or similar source], the CP [W] shall:
    a. Inform the users of the failed system that they must not draw off any cold water [and hot water if a single domestic hot water header] from the affected system until further notice;
    b. Disinfect the tank and distribution system in accordance with the tank cleaning/disinfection procedure;
    c. The tank shall be brought back into service, as detailed in the tank cleaning/disinfection procedure;
    d. The users shall be informed that the system is back in operation;
    e. The AP [W] / DAP [W] shall complete an Incident Report Form.
7. If the occurrence of the warm water is identified as heat gain to the tank (no back flow or cross contamination), drain the tank contents and clean if necessary. A permanent solution, such as ventilation for the plant room or reducing the water storage volume must be implemented;
8. If the occurrence is due to cross connection (this procedure also includes domestic hot water) the CP [W] shall verify the problem by confirming where the cross connection has occurred and the extent of the problem to the domestic distribution system. The reason for the cross connection shall also be identified, this may be due to:
    - Poor or incorrect labelling of the drinking and non-drinking water systems;
    - A lack of training or awareness in identification of drinking and non-drinking water systems of the person who completed work which resulted in the cross connection;

    The AP [W] / DAP [W] shall:
    a. Inform the users of the failed system that they must not draw off any cold water [and hot water if a single domestic hot water header] from the affected system until further notice;
    b. Instruct an approved contractor to disinfect the tank and distribution system then return to service in accordance this procedure and relevant British Standards;
    c. The users shall be informed that the system is back in operation;
    d. The AP [W] / DAP [W] shall complete an Incident Report Form.

4.1.10.5 Domestic Hot Water Failure

This procedure must be employed following a reduction of domestic hot water temperature to below 45°C for any reason. Such temperature reductions can result from system failures such as:

1. Primary heat source failure;
2. DHW Generator water temperature controls failure;
3. Domestic hot water distribution pump failure;
4. System shut down for modification or repair;
5. Poor circulation/pump failure;
6. Blender passing cold water into the hot water system.

The procedure should be applied as follows:

Circumstance	Action
Temperature under performance.	Commence Legionella testing. Upgrade the system to avoid future under performance. Full thermal disinfection.
Routine shutdown for refurbishment / upgrade, involving an outage of < 6 hours. Or Minor failure, involving and outage of < 6 hours.	Pasteurise hot water vessel only.
Major failure e.g., steam failure or power failure, resulting in an outage of >6 hours.	For power failure follow reset procedure. Full thermal disinfection of hot water vessel & system.

4.1.10.5.1Procedure for dealing with Domestic Hot Water <45oc

1. The AP [W] / DAP [W] will be notified immediately. It may be wise to fit the DHW generator with an alarm system. This should be relatively easy to achieve for vessels on a BMS system. The reason for failure must be identified and rectified as soon as possible;
2. The AP [W] / DAP [W] shall notify the users on the failed system that they must not draw off any hot water from the affected services until further notice;
3. The building/dept./ward manager shall ensure that their staff members are aware of the situation, and that in turn shall prevent patients from using affected services;
4. The AP [W] / DAP [W] will identify a CP [W] to be responsible for the thermal disinfection:

a. Raising the domestic hot water temperature of the contents of the DHW generator to 70°C;
b. Circulating this water throughout the affected distribution system for at least one [1] hour;

c. Each tap or appliance should be run in sequence until full temperature is achieved [this should be measured].
d. To be effective the temperature in the DHW generator should be high enough to ensure that all distribution outlets receive water at a temperature of greater than 60°C. Ensure return flow to the DHW generator is a minimum of 60°C;
e. Care must be taken not to exhaust the DHW generator during this operation.
5. The users shall be informed that the system is back in operation;
6. The AP [W] / DAP [W] shall complete an Incident Report Form.

4.1.10.6 Domestic Water Distribution System - Cleaning

1. All visible debris and scale shall be removed from the cistern.
2. The cistern and distribution pipework shall be filled with clean water and then drained until empty of all water.
3. The cistern shall then be filled with water again and the supply closed.
4. A measured quantity of Sodium Hypochlorite solution of known strength shall be added to the water in the tank in order to give a free residual chlorine concentration of 50mg/l [ppm] in the water.
5. The cistern shall be left to stand for one [1] hour, this being the minimum time period for existing cistern, ideally, it should be left for sixteen [16] hours for new installations.
6. After this time period, each draw-off point shall be successively opened working progressively away from the cistern.
7. Each tap and draw-off point shall be closed when the water discharge begins to smell of chlorine.
8. The cistern shall not be allowed to become empty during this exercise.
9. If necessary it shall be refilled and chlorinated as above.
10. The cistern and pipes shall remain charged with chlorinated water for a further one [1] hour.

On completion of this process, the tap furthest from the tank shall be opened and the level of free residual chlorine in the water discharged from this tap shall be measured. If the concentration of free residual chlorine is less than 30 mg/l [30ppm] the disinfection process shall be repeated.

Distribution systems fed directly off the mains water supply shall have a chemical injection point fitted by others, then thoroughly flushed out with clean water until the free residual chlorine concentrations measured at the taps are no greater than that present in the supplier's mains water.

On completion of the cleaning exercise, a certificate of cleaning and chlorination shall be issued stating that the system has been cleaned and chlorinated in accordance with BS EN 806 & BS8558.

It should be noted that in areas which are in use, the time scales detailed about maybe unachievable. As such any variations in time scales shall be agreed on site between the Contractor and AP [W].

5 DESIGN, OPERATION & MAINTENANCE

5.1 Design Control – Get It Right First Time

Water can't be entirely free from aquatic organisms, therefore, measures have to be taken to guard against conditions that encourage microbial growth.

To reduce the risk of outbreaks the design of domestic water systems should eliminate:

- Direct contact of internal parts of pipes & structures by people, animals or birds.
- Backflow of contaminated water into a system conveying drinking water.

In order to avoid potentially costly remedial works, the design of new buildings and their water systems is controlled in order to "get it right first time". The checklist provided in the Appendices, is based on some of the questions contained within an audit checklist used by HSE Inspectors. This checklist should be used by relevant Estates staff and/or supplied to design consultants in order that they may check their own designs. This checklist is not a design brief and is not intended to deal with all potential design issues. It's a management check. If these issues are incorrect it is likely that other aspects of the design are not compliant with good/best practice.

Hot & cold water supplies are considered drinking water. As such the design and installation of domestic hot and cold water services, and associated plant and equipment, in new, upgraded or refurbished premises will comply with documents details below:

- The Water Supply [Water Fittings] Regulations 1999;
- BS EN 806 "Specifications for installations inside buildings concerning water for human consumption" which consists of five parts:
  - Part 1: General
  - Part 2: Design
  - Part 3: Pipe sizing — simplified method
  - Part 4: Installation
  - Part 5: Operation and maintenance.
- BS8558:2015 - Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complimentary guidance to BS EN 806.
- BS EN 1254-2:1998 Copper and copper alloys – Plumbing fittings - Part 2: Fittings with compression ends for use with copper tubes.
- HSE Approved Code of Practice and Guidance Document [L8] – "Legionnaires' disease: the control of Legionella bacteria in water systems" 2013;
- HSG 274 Part 1: The control of legionella bacteria in evaporative cooling towers 2014;
- HSG 274 Part 2: The control of legionella bacteria in hot and cold water systems 2014;
- HSG 274 Part 3: The control of legionella bacteria in other risk systems 2014.
- HTM04-01: Safe Water in Healthcare Premises. Part A: Design, installation and commissioning 2016;

- HTM04-01: Safe Water in Healthcare Premises. Part B: Operational Management 2016;
- HTM04-01: Safe Water in Healthcare Premises. Part C: *Pseudomonas aeruginosa* – advice for augmented care units 2016;

These documents detail the minimum standards for domestic water storage for domestic use. For example, the design of pipework should ensure no possible cross connection between installations conveying drinking and non-drinking water or water from a private source.

Copies of documents from the HSE and Dept. of Health are available as a free download from the internet.

When new designs are produced, consideration is given to the impact of new technologies/ techniques and their impact on water consumption, e.g., the use of alcohol hand-rubs significantly reducing the use of hand basin water supplies. Where external design consultants are used for programmes they are to reference the documents detailed and above and at all times reference these in their supporting documentation.

5.2 Water Supply [Water Fittings] Regulations 1999

On 1 July 1999, the Water Supply [Water Fittings] Regulations replaced the Water Byelaws in governing the prevention of waste, misuse, undue consumption and contamination of public water supplies in domestic and commercial plumbing installations and represents important protection for public health and the environment. In Scotland, these issues were implemented by the Scottish Water Byelaws [2000]. The Regulations are based on performance standards, e.g., British Standards or those European Standards being mandated under the Construction Products Directive. The Regulations are not retrospective and so will not apply to water fittings that were installed in accordance with the Byelaws before 1 July 1999.

The Regulations are enforced by water companies, and further advice should be sought from them or from the Water Regulations Advisory Scheme [Tel: 01495 248454 or www.wras.co.uk]. The Scheme, has produced a guidance document to provide a more detailed explanation of the requirements

The Regulations introduced a new specification to prevent the backflow of water from 1 May 2000. This brings the UK into line with the emerging harmonised European Standard. The system consists of five fluid categories which reflect the potential toxicity of the downstream fluids. These categories relate to the risk posed to public health should fluids contaminate drinking water. The specification then equates each fluid category to the range of suitable backflow prevention devices. Particular reference should be made to the determination of fluid categories when considering alternative water treatment systems. The addition of a treatment chemical to drinking water may result in the need for a back flow device appropriate to the treatment added (subsequent fluid category).

5.3 BS8558:2015 & BS EN 806 (parts 1 to 5)

BS 8558:2011 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. BS 8558:2011 provides complementary guidance to BS EN 806. It is a guide to the design, installation, testing, operation and maintenance of services supplying water for domestic use within buildings and their curtilages.

BS 6700 was withdrawn in July 2012. BS 8558 is now the lead document in the area of domestic water supply. The following parts of BS EN 806 include:

- BS EN 806-1:2000
  Specifications for installations inside buildings conveying water for human consumption. 'General'
- BS EN 806-2:2005
  Specifications for installations inside buildings conveying water for human consumption. 'Design'
- BS EN 806-3:2006
  Specifications for installations inside buildings conveying water for human consumption. 'Pipe sizing. Simplified method'
- BS EN 806-4:2010
  Specifications for installations inside buildings conveying water for human consumption. 'Installation'
  BS EN 806-5:2012
  Specification for installations inside buildings conveying water for human consumption. 'Operation and maintenance'

5.4 BS EN 1254-2:1998

BS EN 1254-2:1998 Copper and copper alloys – Plumbing fittings - Part 2: Fittings with compression ends for use with copper tubes - Specifies materials, assembly dimensions and tolerances and test requirements for fittings of copper and copper alloys with or without plating and coating. This part of EN 1254 specifies connection end dimensions of compression ends for the purposes of joining copper tubes specified in EN 1057. This document should be followed for all work involving compression fittings.

5.5 External Contractors

All external contractors used by the Trust will comply with the requirements set out in the Control of Contractors Policy and sign in with the relevant Estates staff. This will include Contractors having to attend an induction course and being issued with a Contractors Permission to Work letter, issued by the AP [W] / DAP [W].

A specification appertaining to new works will be produced. To include:-

1. A standard form within the contract documentation to define roles, responsibilities and procedures of parties concerned;
2. Submission where applicable of risk assessments and method statements with relation to compiled schedules;
3. Evidence of competency. For the Trust they should be members of the LCA [Legionella Control Association] and be members of WaterSafe. Then evidence of competence of each member of staff who will working on the water systems.

5.6 Maintaining control of systems during construction and testing

During the period of construction and testing, an appropriate biocide will be continuously applied to prevent the accumulation of biofilm. The system[s] will be regularly flushed to ensure the biocide reaches all parts of the system, particularly outlets.

5.7 Testing & Commissioning

The Capital Projects Team with the AP [W] / DAP [W] will ensure that testing and commissioning of hot and cold water services/installations will be completed for each project. During the installation continuous monitoring is required to ensure that:

1. Materials and equipment installed comply with the Water Supply [Water Fittings] Regulations 1999 and other British Standards, and are not otherwise unsuitable. Equipment that is listed in the latest edition of the 'Water Fittings and Materials Directory' and installed in accordance with any of its relevant conditions will comply;
2. The work is done entirely within the specification for the scheme;
3. All the requirements of current legislation are met, both during construction of the installation and when it is completed, particularly with regard to the Health and Safety at Work etc. Act 1974.

5.7.1 Installation Checks

The system should be regularly checked during installation by the contractor with a member of the Capital Projects Team & AP [W] / DAP [W] present to ensure that open pipes, valve ends, cylinder connections etc. are sealed to prevent the ingress of dust/debris that could cause problems during commissioning and subsequent operation.

Checks should also be made to ensure that fittings and materials comply with the Regulations and are those listed in the 'Water Fittings and Materials Directory', and that lead solders are not being used.

5.7.2 Inspection of Joints

Before pressure testing, a member of the Capital Projects Team should identify a number of fittings to be cut out for examination to establish whether the quality of the finished joint meets the specification. The exact number to be cut out will be a ratio of one fitting per 400 installations. In any event, a minimum of two, and not normally more than five, fittings should be cut out for examination. The cutting in shall be completed by the contractor with a member of the Capital Projects Team & AP [W] / DAP [W] present to witness and confirm acceptance.

1. The fittings cut out should be cut open [quartered longitudinally] and examined. If unacceptable joints are found, adjacent fittings should be cut out until the extent of any faulty workmanship has been established.
2. The pipeline should be made good.
3. The tube and fitting should be internally clean and free from particulate matter. Some oxidation will be evident when hot "joints" are made.
4. When copper pipe and capillary fittings are used, because of the viscosity of the brazing filler, full penetration may not be achieved.
5. The minimum penetration at any point must be three times the wall thickness of the tube or 3 mm, whichever is the greater.

5.7.3 Commissioning – An Overview

The Trust requires evidence prior to handover of satisfactory operation of the hot and cold water systems. As such whoever completed the design of the system [be it a member of the Capital Projects Team or an external design consultant] they shall prepare a commissioning brief for use by the contractor's commissioning engineer. This brief should specify fully and clearly the extent of the commissioning and the objectives which must be achieved, and should include:

1. Full design data on temperatures, water flow rates and pressures;
2. Plant and equipment data;
3. Commissioning procedures for thermostatic mixing valves in accordance with HTM04:01 Supplement - Performance specification D 08: thermostatic mixing valves (healthcare premises);
4. Drawings and schematics;
5. A list of test certificates to be provided.

CIBSE Commissioning Code W: 'Water distribution', provides guidance on information that will be required by the commissioning engineers. The Trust requires the designer to:

1. Ensure that their work is in accordance with up-to-date guidance from the Department of Health's Estates & Facilities Division;
2. Prepare commissioning instructions for domestic hot and cold water services, which will list the tests and measurements that are to be taken and recorded by the contractor. These tests and measurements shall be witnessed by the contractors supervising

officer/project engineer who, if approved, will circulate the results, in accordance with the Trust requirements and instructions.

3. Have a commissioning manual be prepared by the contractor which shall be submitted to the Capital Projects Team for review before being issued in final form. The commissioning manual will include schedules of checks and performance tests together with record sheets.
4. Ensures the whole commissioning procedure to be carried out under the guidance of a single authority [the involvement of specialists or manufacturers for specific items of plant is acceptable to the Trust]. The contractors supervising officer / project engineer to witness commissioning and testing and to countersign all relevant test record documents.
5. Ensure all measuring equipment to be used by the contractors supervising officer / project engineer to have valid calibration certificates, these shall be submitted to the Capital Projects Team prior to commencement of commissioning.
6. Ensure all commissioning and testing to be carried out in a logical and methodical manner.
7. Issue the following at handover:

- "as installed" record drawings;
- Schematic diagrams;
- operating and maintenance instructions;
- Certified records of pressure testing;
- Water sampling results;
- Disinfection certificates.

On completion and prior to handover the installation should be operated by the contractor as a whole, and subjected to functional or performance tests as specified by the designer.

The Capital Projects Team shall be satisfied that the system meets the design intent, the final accordance record sheets should be completed. If performance is not acceptable, the matter shall be dealt with in accordance with the contract requirements.

The following checklists have been prepared as a brief summary of the key activities associated with the pre-commissioning of cold and hot water storage and distribution systems. The designer shall satisfy the Trust that all commissioning and testing has been completed in full. Pre-commissioning checks shall be carried out on completion of the system installation, filling and pressure testing.

5.7.3.1 Cold Water Installations

1. Systems have been provided and installed in accordance with specification and drawings, and that the systems are charged with water, vented and free from leaks;
2. Water storage cisterns are free from distortion and leaks, are properly supported and secured, are provided with correctly fitting covers, and are in accordance with the Water Supply [Water Fittings] Regulations 1999;

3. Distribution pipework is rigidly supported, insulated, and incorporates adequate provisions for venting, draining, expansion, isolation and measurement of flow, temperature and pressure;
4. Pipework systems have been pressure tested;
5. Pipework systems to the outlet and storage cisterns have been flushed, disinfected, and water samples taken for TVCC & Legionella analysis [2-7 days post completion of chlorination] with appropriate certification received, and that specified residual chlorine levels are attained;
6. Pipework systems and storage/break tanks are correctly identified and marked;
7. Regulating valves and flow control devices operate freely;
8. Water meter[s] is/are fitted correctly;
9. Electrical isolation, cross-bonding and wiring of system components are installed in accordance with the current edition of BS 7671.

Upon satisfactory completion of the pre-commissioning tests, the commissioning tests can commence. Commissioning checks and tests to be applied are as follows. Check that:

1. Overflows run freely and discharged water does not cause flooding or damage, and that drain down points flow when released and are free from leaks when shut;
2. Float-operated valves function satisfactorily and are adjusted to give the correct water level;
3. Control valves operate correctly and shut-off valves close tightly;
4. All electrical circuits are tested and the pump motor direction of rotation is correct, and that electrical controls and alarms function correctly;
5. Operation of any safety or anti-flood device is satisfactory;
6. Circulating or lifting pumps are free from excessive noise, vibration and leaks;
7. Remote control of pumps [if appropriate] is satisfactory;
8. The installation is vented and regulated;
9. The flow rate into, and out of, storage cisterns is recorded;
10. All taps, mixers and outlets operate satisfactorily, and test and record mass flow from outlets in positions shown on contract drawings. [TMVs require hot and cold water for testing and commissioning. Type 3 TMVs are commissioned in accordance with MES D08.];
11. Temperature of water in storage cisterns [see below for temperature testing parameters] is appropriate;
12. Full load current of components does not exceed the recommended values;
13. The running current of components does not exceed the recommended values;
14. Pump thermal overload trips are set;
15. System schematic is displayed in a frame in the relevant plantroom, complete with valve schedule.

5.7.3.2.1.1 Hot Water Installations

1. Systems have been provided and installed in accordance with the specification and drawings;
2. The system is charged with cold water, vented, and free from leaks;

3. Hot water storage vessels are free from leaks and are properly supported and secured;
4. Distribution pipework is rigidly supported, insulated, and incorporates adequate provision for venting, drainage, expansion, isolation, and measurement of flow, temperature and pressure;
5. Pipework systems, storage cylinders etc. have been pressure tested, flushed and disinfected, water samples taken for TVCC & Legionella analysis [2-7 days post completion of chlorination] and appropriate certification has been received, and that specified residual chlorine levels are attained;
6. Pipework systems, calorifiers and cisterns are correctly identified and marked;
7. Regulating valves and flow control devices operate freely;
8. All control and regulating valves are labelled or marked to correspond with reference numbers on contract drawings;
9. Electrical isolation, cross-bonding and wiring of system components is installed in accordance with the current edition of BS 7671;
10. System schematic is displayed in a frame in the relevant plantroom.

Upon satisfactory completion of the pre-commissioning checks, the commissioning checks and tests can then be started. Commissioning checks and tests to be applied are as follows:

1. Drain down points flow when released and are free from leaks when shut, and that air vents and release valves open correctly and are airtight when shut off;
2. All temperature and other controls are adjusted and calibrated to agreed design limits of system performance [see below for temperature testing parameters] ;
3. All electrical circuits are tested and the pump motor direction of rotation is correct, and that electrical controls and alarms function correctly;
4. Control valves operate correctly and shut-off valves close tightly;
5. Heat exchangers operate satisfactorily;
6. Primary heating circuits are adjusted and regulated, and thermostatic settings are correct; and that bypass circuits and automatic control valves operate correctly;
7. Circulating pumps are free from excessive noise, vibration and leaks;
8. Remote and automatic control of pumps [if appropriate] is satisfactory, and there are no leaks at joints under maximum flow conditions;
9. Secondary circuits are regulated and vented;
10. Thermostatic mixing devices and regulating valves are adjusted and set to desired values [TMVs require hot and cold water for testing and commissioning, and should be commissioned in accordance with HTM04:01 Supplement - Performance specification D 08: thermostatic mixing valves (healthcare premises) [see below for temperature testing parameters];
11. All taps, mixers and outlets operate satisfactorily;
12. Water flow quantities at all plant items, regulating valves and flow-measuring valves are recorded;
13. Mass flow from taps, main and other outlets in positions shown on contract drawings is satisfactory;
14. Pressure drop at heat exchangers at full design demand flow is tested and recorded;
15. Hydraulic balancing of hot water secondary circulation system is carried out to ensure that minimum temperatures are achieved in all parts of the circuit;
16. Full load current of components does not exceed the recommended values;

17. The running current of components does not exceed the recommended values;
18. Pump thermal overload trips are set.

5.7.3.2.2 Pressure testing

Pressure testing must be carried out before disinfection. Except where otherwise specified, testing of underground pipelines should be carried out in accordance with the requirements of the Water Supply [Water Fittings] Regulations 1999.

Open pipes should be capped and valves closed to avoid contamination.

5.7.3.4 Temperature testing

These tests should be performed prior to contractual handover and bringing the system into use. Separate thermostatic measuring and recording equipment should be used, that is, independent of any building management system. It will be necessary to have systems fully operational and to simulate typical draw-off of water.

Tests should include:

1. Measuring the incoming water temperature at the main water meter;
2. Testing the inlet, outlet and surface water temperatures of cisterns and cold water feed/header tanks for the hot water calorifiers. The temperature should not be greater than 2°C above that measured at [1];
3. Testing the flow and return temperatures at connections to calorifiers and water heaters. These should not be less than 60°C and 50°C/55°C respectively;
4. Testing the temperature in branches of hot water circulating systems installed in all departments to ensure that the system has been balanced, and that under “no draw-off” conditions 55°C is achieved in the circulating system at outlets furthermost from the calorifier/heater;
5. Testing sections of a non-recirculating hot water system at branches to ensure that the trace heating is effective and that under no-flow conditions 55°C is achieved; testing single hot water outlets and inlets to mixing valves to ensure that a minimum of 50°C/55°C is achieved within 1 min.

Note
A minimum of 55°C may be required for the operation of suitable mixing devices required to provide “safe” hot water at the upper limit of the recommended range. Hot water at 55°C is required in many cases for reasons of food hygiene or decontamination requirements, for example in kitchens and sluice rooms. In a properly balanced hot water circulating system, with the circulation taken close to the draw-off point, achieving temperature should be virtually instantaneous. At a typical flow to a wash-hand basin of 4.5 L/m, 1 min to achieve temperature would indicate a 25 m dead-leg of 15 mm pipe or that the system is out of balance.

- Testing single cold water outlets and inlets to mixing valves to ensure that temperature equilibrium below 20°C is achieved within 2 min.

Note
The Health and Safety Executive [2013] Approved Code of Practice L8 [rev 4] permits a period of 2 minutes to achieve an equilibrium temperature below 20°C. Achieving this minimum requirement would be indicative of an exceptionally under-utilised water system in an unoccupied building. During commissioning, therefore, it is essential to encourage draw-off to simulate normal usage. [At a typical flow to a hand-wash basin of 4.5 L/m, 2 min to achieve temperature would indicate a 55 m dead-leg of 15 mm pipe or that stagnation is occurring.]

- Testing the temperature at hot water draw-off points to ensure that they comply with the recommended temperatures in this WSP/Tech.

5.8 Contaminated Aerosols

The disinfection procedures presented for cold water storage tanks, domestic hot water vessels and water systems are designed to minimise the risk to staff and others that may come into contact with water. In all instances of draining, water should be drained in such a way as to avoid the creation of an aerosol. This also applies for the safe purging of stagnant water e.g., from unused outlets. 'Safe Purging' is defined in Section 3 of this WSP/Tech.

The appropriate protective clothing should be worn during such procedures. This can be a powered filter and hood, European Class TH3 [assigned protection factor of 40] or a power assisted filter and close fitting full face mask TM3 [assigned protection factor 40]. It should be borne in mind that the filter on these systems is liable to get wet and subsequent resistance to air can increase with consequent discomfort to the operator.

Alternatively, a hood or full-face mask fed with breathing quality compressed air may be used. The preferred equipment is a full-face close fitting airline mask with a positive pressure demand valve, under a hood or helmet protecting the rest of the head. The air supply should come from an oil free compressor drawing air through a filter from a location well upwind of any jetting operation or using cylinder supplies of compressed air. Further information on respiratory protective equipment [RPE] can be obtained from *Respiratory Protective Equipment - legislative requirements and lists of HSE approved standards and type approved equipment* and also *HS [G] 53: The selection, use and maintenance of respiratory protective equipment [2nd Edition]*. Personnel using RPE must be adequately trained to do so and equipment must be properly maintained.

Where possible, cleaning methods which create an aerosol [e.g., high pressure water jets] should be avoided. If this is not possible, the operation should be executed when the building is unoccupied, or in the case of permanently occupied building, windows in the vicinity should be closed and air inlets temporarily blanked off. As systems requiring cleaning will have high organic load the operator and others closely involved should wear suitable respiratory

protective equipment. The high pressure jet wash must be fed from a drinking water supply with suitable air break to prevent back flow.

5.9 Other Health & Safety Issues

If plant is located in confined spaces, reference on entry into confined spaces can be sought from Safe Work in Confined Spaces Approved Code of Practice, Regulations and Guidance [L101].

Because water treatment chemicals, including chlorine-containing chemicals and solutions, are often toxic or corrosive they should be used cautiously to ensure that they do not endanger the users or other occupants of the building. Caustic resistant gauntlet type gloves will be required. Water treatment should be carried out by, or under the direction of, people who are suitably qualified and experienced.

The use of water treatment chemicals should be subject to a COSHH assessment and permission would be required from the water authority prior to any discharge to sewers, storm water drains and watercourses. The Environment Agency should be contacted prior to direct discharge to water courses.

5.10 Operation of Premises

5.10.1 Occupation of New Premises

5.10.1.1 Procedure until Occupation

This procedure is designed to prevent the risk of water borne bacteria developing in a new building/department through the interim period following construction, commissioning and hand over to occupancy.

At the point of hand over all relevant information on system performance together with as-fitted drawings and design criteria of the domestic hot water systems and cold water services shall be submitted to the AP [W] / DAP [W] who will be authorised for the premises. In addition, the certificates of chlorination for all systems, flushing records post chlorination of all outlets, and the testing & commissioning data.

Once the system is in use a CP [W] shall be nominated to monitor and observe the system through routine monitoring tasks and PPMs as detailed within this WSP/Tech.

5.10.1.2 Routine Operation of Water Outlets

Occupancy of the new property should be as soon after hand over as possible to prevent further costs being incurred due to the need for re-chlorination of the water systems. From handover until the time at which the building is fully occupied, flushing any unused or little used outlets will be undertaken on a twice weekly basis. The AP [W] / DAP [W] will review and consider the installation of continuous dosing on large systems which are not occupied immediately.

In all healthcare buildings water draw off will form part of the daily cleaning process. Written instructions for this practice will be issued to domestic staff by Facilities Team. Any areas that do not form part of the daily cleaning process must be informed to the AP [W] for managing i.e., flushing.

5.10.2 Procedure in the Event of Closure of Part or All of a Building

5.10.2.1 Background

Where part or all of a building is going to close for a period of greater than one week, the relevant building/dept./ward manager must notify the AP [W] / DAP [W] of the details.

Following a closure decision, negotiations between the relevant manager and the AP [W] / DAP [W] must take place to ensure that the following procedure is established and documented, and to clearly define what actions named individuals shall perform.

5.10.2.2 Period of Closure

The period of closure should be established at the earliest point in negotiations. The period for which an area is closed can play an important part on the cost implication and involvement of a closure.

5.10.2.3 Temporary Closure

Where a closure is expected to not exceed 60 days a weekly PPM will be implemented by AP [W] / DAP [W] where a nominated CP [W] shall be identified and every outlet will be run for 3 minutes once/twice a week and flush every toilet twice a week. The CP [W] shall complete the record sheet, signed by themselves and forward to the AP [W] / DAP [W].

Before the closed area is re-occupied the AP [W] / DAP [W] shall carry out an inspection and test of the water systems and report its condition RP [W] for any remedial works that may be required.

At the end of the 60 day closure period then a review shall take place to identify if the area can be reoccupied. It is the responsibility of the relevant manager to notify the AP [W] / DAP [W] of their intention to re-open a temporarily closed area.
If the area is to be reoccupied within the immediate future (within 30 days) then the once/twice weekly flushing shall continue.

In the instance that part or all of a building is to remain closed with no planned re-opening date [this will be classed as 'Indefinite Closure'], negotiations must be held as detailed above and funding be made available to the AP [W] / DAP [W] by the building/dept./ward manager for the area that is closing, in order to disconnect and drain the water services within the affected area. The building/dept./ward manager should be aware that considerable cost for modifications could be needed to achieve this requirement in some large properties.

5.10.2.4 Indefinite Closure

In the instance that part or all of a building is to close with no planned re-opening date, or where the closure period exceeds 60 days, negotiations must be held as detailed above, and funding made available to the AP [W] / DAP [W] by the building/dept./ward manager of the area that is closing, in order to disconnect and drain the water services within the affected area. The building/dept./ward manager should be aware that considerable cost for modifications could be needed to achieve this requirement in some large properties.

5.10.2.5 Detail of Works for an Indefinite Closure

1. Where relevant - all water tanks associated with the affected area shall be drained, cleaned and dried out.
2. All pipework and devices shall be drained and where applicable DHW generator [or other storage vessels] shall be opened up, cleaned and left open to the atmosphere.
3. Pipework shall be disconnected from the mains services and capped off, mains cold water services shall be isolated and capped off from the system and all relevant pipework drained.
4. Notices shall be posted throughout the affected area stating that all water services are disconnected.
5. The Estates Department shall be responsible to ensure that an adequate water seal exists in unused toilets to prevent odours from the foul drain system entering the premises.
6. Adequate records of actions, and amended water service schematic diagrams shall be produced by the Estates Department showing the relevant modifications and disconnections made to the water systems.

5.10.3 Procedure in the Event of Re-occupation of an Indefinitely Closed Area

In the event of re-occupation of an indefinitely closed area, full negotiations must take place between the relevant building/dept./ward manager and the AP [W] / DAP [W] prior to the re-occupation exercise. The AP [W] will require the following information:

1. The planned re-opening date;
2. Any proposed changes of use of the area;
3. Any areas which will not be used.

The AP [W] / DAP [W] will provide the relevant manager with a cost to put the water systems *[for which the relevant* building/dept./ward *manager must provide funding]* back in service.

Before the water system is put back into service, any necessary modifications and maintenance shall be carried out prior to the cleaning of the system.

5.11 Operation of Domestic Water Systems

System/Service	Task	Frequency
Domestic cold water pressurisation pumps	• Switch over pumps automatically, • Or, manually.	Daily Daily
Domestic water tanks	• Where multiple tanks, operate in parallel. • Where one or more tanks are drained, ensure that all interconnecting pipework and mains cold feed are drained and vented. • Check tank temperatures and visually inspect and carry out remedial [where necessary].	Start-up At changeover Annually
DHW Generator	• Where multiple, operate in parallel. • Where one or more DHW generators are drained, ensure that all interconnecting pipework and cold feed are drained and vented. • Thermostat set to achieve minimum flow temperature of 60°C and a return temperature of at least 55°C. • In premises with high vulnerability occupants, DHW generator to operate 24 hrs per day, 7 days per week. In other premises operate by time clock, to achieve full temperature one hour before occupation and one hour after each day.	Start-up At changeover Start-up Start-up
DHW generator shunt pumps	• Control by time clock. • Alternatively, if data plot for one week shows that DHW generator performance criteria are met under continuous pump operation.	1 hr / night Continuously
DHW distribution pumps	• In premises with high vulnerability occupants, distribution pumps to operate 24 hrs per day, 7 days per week. • In other premises operate by time clock, to achieve full temperature one hour before occupation and one hour after each day.	Start-up Monthly

	• Manual check that the distribution pump[s] are operating effectively [by temperature checks].	Monthly
Air conditioning plant - humidifier	• Set the fan to operate for 30 minutes before the humidifier starts up. • Set the humidistat to a maximum of 70% relative humidity.	Start-up Start-up

5.12 Cold Water Cisterns and Cold Feed Tanks

All new domestic cold water storage cisterns and tanks shall:

1. Be subject to risk assessment as defined in the Policy on Water Safety;
2. Comply with the requirements of the Water Supply [Water Fittings] Regulations 1999 & BS.8558 & BS EN 806 (parts 1 to 5) for cold water storage;
3. Be examined and the temperature tested annually and cleaned and disinfected as required [see photo guide associated with the record sheet for task] as detailed in the Potable Cold Water Tank Inspection Procedure. When a tank is inspected, the presence of a label stating its contents and capacity is verified. If it is lacking then a new label is to be fitted.

5.12.1 Connections to Outside Services

The existence of these connections and their necessity is checked on an annual basis and recorded, ensuring that an appropriate back flow prevention device has been installed applicable to the connections usage.

5.12.2 Connections to Inside Services

Mains water fed devices can included chilled drinking water units, vending machines and ice machines [non touch automatic dispensing type only]. All devices should be used regularly on a daily basis.

Chilled drinking water units, vending machines and ice machines will be checked annually and recorded to ensure such units are connected to a drinking water supply (not softened). These connections will be via a double check valve and upstream of a regularly used outlet but not exceeding a distance of 3 metres in supply pipe length.

Where it is suspected such a device has not been operated for periods greater than one week it should be discharged with the spray head under water to prevent the release of aerosols.

If the device is not required they should be isolated from use and removed. The supply feed pipe work will also be removed and cut back to the T joint of the main supply.

Each cold water dispenser will:

1. The suppler / installer will provide a risk assessment and a work method prior to any installation.
2. Estates will be notified of the planned installation and they will then provide a connection for the suppler / installer of the device to connect too. The water supply to the device will not exceed 3 metres from a high use outlet.
3. The supply feed to the device shall not be exposed to heat sources i.e., heat exhaust vent at the rear of the device / radiator.
4. A chlorination certificate for each device installed will have to be supplied by the suppler / installer.
5. If a ward / dept. require such a device they will have responsibility to ensure an appropriate cleaning processes are developed and undertaken as well as ensuring a maintenance contract is in place.

5.12.3 Pressurisation / Supply Pumps

Where two or more pumps have been fitted for pressurisation systems, the lead pump shall be changed over at daily in order to avoid water stagnation, with records kept detailing the switch over.

Where pumps have not been in service for a period of four weeks or greater, or have been removed for any reason, the pump and associated pipework shall be thoroughly washed out and disinfected before being brought back into service. Disinfection of pumps shall be to 50ppm free residual chlorine for 1 hour and pumps shall be totally submerged during this period. Incident Report Form shall be completed giving details of why the pump was out of use. Details of any such action shall be recorded in the plant room log book.

5.13 Domestic Hot Water Systems

Calorifiers, direct gas water heaters, angelerys, plate heat exchangers, hot water cylinders & any associated buffer vessel are all a means of producing & storing domestic hot water and are subject to the procedures below. Hereafter the term "DHW Generator" is used to describe any of the above mentioned domestic hot water storage vessels. All new domestic hot water storage vessels shall comply with the requirements of the Water Supply [Water Fittings] Regulations 1999 & BS.8558:2015.

5.13.1 Hot Water Storage and Distribution Temperatures

The storage of domestic hot water should be arranged to ensure that a water outflow temperature of at least 60°C is achieved. It is important to maintain temperatures at above this figure [Legionellae organisms will survive for only a short period of time above this temperature - approximately two [2] minutes].

Permanent continuous monitoring of water temperatures via a building management system or data logger is recommended for higher risk premises in order to demonstrate performance.

The outflow water temperature, under prolonged maximum continuous demand [at least 20 minutes] from DHW Generators should not be less than 60°C.

While it is accepted that occasionally under peak instantaneous or prolonged demand that the water outflow temperature will fall, it is not acceptable if this occurs frequently [more than twice in any 24 hour period] and / or for long periods [exceeding 20 minutes].

Under no circumstances shall the domestic hot water flow temperature fall below 50°C.

It is recommended that disinfection by pasteurisation is undertaken if the water temperature of the DHW Generator falls below 45°C.

DHW generators in high risk premises such as healthcare are to be run 24 hours per day, 7 days per week, and the domestic hot water circulation pump kept running.

A minimum domestic hot water circulation temperature of 50°C/55°C at outlets [and inlets to TMVs] shall be maintained.

Should it be necessary for interrupted operation or shut-down over night, then the DHW Generator should be allowed to maintain its water storage temperature and the domestic hot water pump should be started up to ensure full temperature through-out the distribution system for at least one hour prior to occupation of the premises.

In other healthcare premises which do not operate through the night then the system will shut down one hour after closure and will come back on line for before re-occupation on the next day ensuring the system has achieved circulation of 60°C through the distribution system for at least one hour.

5.13.2 Domestic Hot Water Circulation Pumps

Domestic hot water circulation pumps should perform in such a way to ensure a minimum water circulation temperature of 50°C/55°C throughout the system.

Only one domestic hot water distribution pump should be installed near the DHW Generator, and a spare pump kept for immediate replacement in the event of pump failure.

Where multiple distribution pumps exist then the duty / stand by pumps will be switched over on a daily basis, with records kept.

Multiple distribution pumps on new installation are prohibited.

It is not permissible to shut down the pumped circulation system. To do so will result in a loss of the required distribution temperatures.

5.13.3 Electric Water Heaters

Point of use water heaters [no greater than 15 litres]:

- Check water temperature to confirm heater operates at 50°C/55°C. Monthly to six monthly.

Combination water heaters:

- Are not advocated for use in healthcare premises.
- Check water temperature to confirm heater operates at 50°C/55°C. Monthly to six monthly.
- Inspect integral cold water [as part of tank inspections program] and clean and disinfect, as necessary. Annual.

5.14 Air Conditioning Plant

5.14.1 General

Air conditioning and ventilation plant and duct-work should be inspected at the access point[s].

Plant inspection is to be on a quarterly basis for critical ventilation plant and biannually for non-critical ventilation plant basis in order to check cleanliness and general condition.

After several years of service, even a correctly filtered system may contain dirt accumulation. It may be necessary to consider cleaning of the system. However, accumulation of dirt in a relatively short period of time is indicative of either:

- poor filter arrangement and design;
- the use of incorrect filters; or
- failure of the filtration system.

In particularly polluted areas, it may be necessary to consider the installation of high grade final and pre-filters. The quality of filter housing design and in particular the seals are a critical

factor in maintaining the efficiency of the filtration system by ensuring that air does not bypass the filter panels.

All information on condition, cleanliness etc. to be recorded in the plant room log book, with any non-compliance or incidents being identified to the AP [W] / DAP [W] immediately on identification, and an Incident Report Form [see Appendix 2] to be completed.

5.14.2 Draining Traps and Pipework

A drainage drip tray should be provided, to collect condensation collecting on cooling coils [including the return bends and headers], and for humidifiers, eliminators and, if necessary, heat recovery devices. The drainage drip tray should be constructed of a corrosion resistant material and be so arranged that it will completely drain - i.e., the drain connection should have no up stand in order to prevent 'pooling'. The drainage tray should be large enough to collect all the water produced by the device it serves. Provision should be made to allow for inspection of the drainage tray [i.e., viewing window / access panel].

Any jointing materials used to seal the drainage tray to the duct must be listed in the Water Fittings Directory and must not be capable of supporting bacterial growth. A slope of at least 1:20 in all directions towards the drain outlet position should be incorporated.

Drainage drip trays should be connected to a drainage trap assembly which should discharge via a type A air gap as laid down in BS 6281:Part1:1988.

The depth of any trap should be at least twice the static pressure head generated by the fan so that the water seal is not 'blown out' during plant start-up.

A trap need not be directly under the drainage drip tray which it serves, provided that the connecting pipework has a continuous fall. Each trap shall be made of the clear [borosilicate] glass or transparent plastic type in order to clearly show the integral water seal level, and should be fitted with a screw top cap to permit re-filling. The water seal level shall be permanently marked on the trap, to indicate the water seal levels when the fan is operational at its design duty. Each installation should incorporate quick release couplings to facilitate easy removal of the traps.

Traps fitted to plant located outside or in unheated plant rooms may require trace heating to prevent freezing damage during the winter period. The trace heating system employed should not raise the temperature of the water in the trap to greater than 5^{o}C. Similarly, it may be necessary to shield the trap from the direct sunlight of mid-summer in order to prevent heat gain and algal growth.

The pipework from each trap should be constructed of thermoplastic, copper or stainless steel tube. Stainless steel may be particularly useful in instances where greater mechanical strength is required. The pipework shall have a minimum fall of 1 in 60 in the direction of water flow.

Water from each trap should discharge over [at least 15mm gap between pipe and top of tundish] an open tundish connected to a drainage stack via a second trap, or a floor gully.

Where the drainage pipework from the tundish outlet, which should be ventilated, discharges to a surface water drainage stack or a dedicated plant drainage stack, then the connection shall be in the form of an easy sweep tee.

It may be necessary to employ chlorine or other chemicals in order to clean humidifiers and cooling coils etc. Under such circumstances it is necessary to discharge the plant effluent produced to the foul drainage system.

Individual drainage systems should be separate wherever possible.

5.14.3 Heater & Cooler Batteries

Inspection of the heater & cooler batteries is necessary in order to ensure free air flow and no build-up of dirt, scale or other debris. Cooling coils should be examined on a quarterly basis for critical ventilation plant and biannually for non-critical ventilation plant in order to ensure that correct drainage is being achieved, and that there is no pooling of water or development of slime, algae or other deposit.

Drainage drip trays should be removed [if possible] and cleaned on a regular basis. Monitored PPM task issued on Planet FM.

5.14.4 Humidifiers

The steam supply connections to the humidifier should be provided with a dirt pocket and trap set installed as close as practicable to the humidifier.

The water supply to the steam generating unit shall be designed as if drinking water supply right up to the device.

The humidifier chamber should be inspected on a quarterly basis for critical ventilation plant and biannually for non-critical ventilation plant basis this is defined in the plant PPM schedule. Particular attention should be given to any pooling of water. The chamber interior should be clean, and free from any scale or other build-up on the walls. On occasion, cleaning and / or re-lining may need to be carried out by a specialist contractor. Monitoring form to be completed [see Appendix 2].

5.15 Other Air Conditioning Units

5.15.1 Portable A/C Units

From the date that this procedures document was accepted the Trust prohibits the use of such devices within any of the Trust properties. The Trust has prohibited the use of such devices on the grounds that HTM03:01 paragraph 5.28 states 'units employing an internal water reservoir and wick to promote evaporative cooling must not be used in healthcare premises'. These units also require substantial frequent maintenance which is costly.

In exceptional circumstances and only with the prior consent of Infection Control closed circuit portable a/c units (those **without** an internal reservoir and wick) maybe used. They will be operated as detailed below:

1. Units are on an asset register;
2. Each unit is inspected and thoroughly cleaned before being taken for use;
3. Those units being used in areas with immunocompromised patients will be fumigated before use;
4. Those units which have been used in isolation rooms or areas containing infective patients will be fumigated before being used in other located or returned to the stores.
5. Each unit will be inspected and cleaned every week they remain use.

5.15.2 Split Units

These units incorporate internal recirculation air filters and a drainage system to remove condensate form the cooling coil. The systems used around the Trust properties are not in continuous use (i.e., 24/7) and a review of the condition of these systems has found that the units only require an inspection and clean every 6 months by an external contractor.

5.16 Water Softeners / RO units

Task	Frequency
Visually check the salt levels and top up salt [if required]. Undertake a hardness check to confirm operation of the softener. Conductivity or RO permeate monitored and regeneration cycle initiated as required.	Weekly [but depends on the size of the vessel and the rate of salt consumption]
Service & disinfect	Annual [or according to manufacturer's guidelines]

5.17 Dripper Systems

Task	Frequency
Not present within High risk locations and remain disconnected for approx. 6 month period each year.	Prior to re-connection pipework system replaced and flushed through accordingly.

5.18 Wet Fire Hose Reels

Task	Frequency
Present on dedicated fire main and elsewhere Trust decision is not to use. Various now either disconnected or removed.	These that remain in place will be removed where possible and in line with on-going Legionellosis risk assessment.

5.19 Dental Chairs

Task	Frequency
Drain down, clean, flush and disinfect all system components, pipework and bottles	Twice daily [typically at the start and end of each working day]. Disinfectant contact times as recommended by manufacturer.
Clean storage bottles, rinse with distilled water or Reverse Osmosis [RO] water, drain and leave inverted overnight	Daily
Take microbiological measurements – refer to HTM01-05	As indicated by risk assessment

*Chairs serviced by KAVO but at the time of writing detailed maintenance information still being sought.

5.20 Pressure washers

Task	Frequency
Units safely [i.e., under water or by other means locally] flushed for a period of 1 minute prior to use with label attached to units. All units disconnected post use.	At all times, prior to use

5.21 Patient Contact Equipment [i.e., respiratory nebulisers, humidifiers]

Task	Frequency
All nebulisers are cleaned and dried after use. See policy PAT IC 24 v7- Cleaning and Disinfection of Ward-based Equipment . Medical humidifiers are maintained in accordance with manufacturer's instructions. Additionally, both sterile water used in both ultrasonic nebulisers and medical device humidifiers, provided via Pharmacy dept	In accordance with manufacturers guidance and agreed by WSG.

5.22 Heater Cooler Units (HCU)

Task	Frequency
Use of HCUs subject to risk assessment. Unit located within DCC	Annual check undertaken although in accordance with manufacturer's guidance and agreed by WSG.

5.23 Birthing Baths / Pools

Task	Frequency
See Appendix 4 Birthing pool documentation	After each use.

5.24 Hydrotherapy Pool

The Hydrotherapy pool has its own separate operations and procedures manual which details the operational and monitoring requirements for the pool. <u>The pool is not currently in use.</u>

6 TECHNICAL PROCEDURES

Water systems will be cleaned and disinfected under the following circumstances:

System / Service	Circumstance Requiring Cleaning and Disinfection	Frequency
Domestic cold water tank	• New installations and small modification/ additions.	As required
	• Empty tank re-commissioning.	As required
	• Tank temperature exceeds 20°C.	As required
	• Tank contains moderate sediment, *i.e., a complete covering of the tank base*.	As required
	• Tank contains moderate corrosion.	As required
	• Contamination of tank by vermin or vermin faeces.	As required
	• Gross organic contamination *e.g., large number of dead insects*.	As required
	• Regular programme for high risk healthcare category.	As required
	• Regular programme for medium risk healthcare category.	As required
	• Regular programme for non-healthcare premises *[excluding small tenanted residential properties]*.	As required
	• Consultant advice - interpretation of microbiological results	As required
Domestic cold water distribution system	• New installations and small modification/ additions.	As required
	• Contamination of system by vermin or vermin faeces.	As required
	• Gross organic contamination *e.g., large number of dead insects*.	As required
	• Consultant advice - interpretation of microbiological results.	As required
Domestic hot water generator	• New installations and modifications / additions.	As required
	• DHW Generator falls below 45°C.	As required
	• Empty DHW Generator re-commissioning.	As required
	• Contamination of header tank by vermin or vermin faeces.	As required
	• Regular programme *[excluding small tenanted residential properties]*.	Annually
	• Consultant advice - interpretation of microbiological results.	As required
Domestic hot water distribution system	• New installations and modifications / additions.	As required
	• Contamination of system by vermin or vermin faeces.	As required
	• Consultant advice – interpretation of microbiological results.	As required
Air handling unit	• Contamination by vermin or vermin faeces.	As required
	• Gross organic contamination e.g., large number of dead insects.	As required
	• Chiller battery, drip trays, humidifiers and drainage pipework.	Quarterly* Biannually**

* Critical ventilation plant

** Non critical ventilation plant

6.1 Domestic Cold Water Systems

6.1.1 Tank Cleaning Procedure

Members of staff either of the Trust, or contract staff shall not be permitted to enter any water storage system [i.e., tank, DHW Generator, AHU] if they are suffering or have recently suffered from any gastric or other communicable illness, or a condition which may result in their increased susceptibility to legionellosis. It is the responsibility of the individual to inform their AP [W] / DAP [W] immediately if applicable.

All tanks are classified as drinking water tanks.

The AP [W] shall notify all users of the proposed line of action, and of any disruption or modification to service. The AP [W] being the individual responsible for the management of the task in question. The pre-maintenance authorisation record will be completed prior to any works commencing.

All equipment and tools to be employed during the cleaning and disinfection process must be dedicated only to this task [this will include hire equipment]. All equipment should be disinfected in a high concentration of chlorine solution prior to commencement of the process.

The Process Steps [Free Residual Chlorine]:

1. Isolate and shut down the cold water storage tank and remove the cover or inspection hatch. The operator shall display warning labels in and around the plant room stating chlorination in progress;
2. The tank shall be examined visually for signs of corrosion [if applicable], debris and biological growth. The water storage temperature and any such defects identified are recorded for report to the AP [W];
3. The relevant water authority must be informed before dumping the tank contents. The relevant water authority will need to be informed of the volume to be discharged, any further quantities of chlorinated water to be dumped as a result of tank cleaning should be included. It may be necessary to neutralise the chlorine with sodium thiosulphate before dumping.
4. Tank cleaning shall be performed using non-abrasive cleaning materials;
5. Protective clothing, footwear, face goggles and masks are to be employed. These items must be specific to the task of cleaning and chlorination, and must not have been used for other activities;
6. Where tanks are to be painted, only paints or coatings and materials that are recognised and approved by WRAS and detailed in "The Water Fittings and Materials Directory" shall be employed. The specification for any such product must be submitted to the Responsible Person or their nominated deputies for their approval prior to use;
7. Details of all cleaning and painting materials shall be listed on the appropriate record keeping form [see Appendix 2];

8. On completion of the cleaning / painting exercise, and after the necessary paint maturing period [if required], the tank shall be thoroughly flushed and washed out with water, refilled to the tanks normal working level and dosed to a level of 50mg/l of free residual chlorine. The tank shall be left to stand for a minimum period of one [1] hour. During this period, the level of free chlorine shall be monitored and maintained at 50 mg/l to ensure adequate disinfection of the tank;
9. On completion of the tank chlorination period, the tank contents shall be discharged as previously detailed in section [c]. The tank is then refilled to its normal operating level with fresh water. The free chlorine level in the tank water shall be monitored until it matches that of the incoming water supply;
10. On completion of this exercise the tank shall be put back into service immediately, and water samples taken for analysis between 2-7 days post completion. Water samples should be taken from the mains supply (the control sample) and from the tank using dip sampling method [as defined in section 1] for deposit and examination at a UKAS accredited laboratory.
11. The analysis shall include:

Full Bacteriological Examination	Unit of measure	Acceptable parameter
Total coliforms	/ 100ml	0
E coli	/ 100ml	0
Colony Count @ 2 days(+/-4hrs) @ 37°C	/ ml	No abnormal change*

* It is worth noting that colony counts can vary significantly between regions and seasons. The benefit of such data is the comparison for any indication of seasonal change and longer term changes in the general bacteriological quality of the water.

12. On receipt of analysis results, these shall be submitted to the AP [W] / DAP [W] and the Infection Control Team. The ICO [W] may be required to aid with the interpretation of the results, and the identification of remedial actions if necessary. The Infection Control Team shall certify if the water is of a drinking water quality.
13. On completion of the tank cleaning or inspection exercise, it is recommended that details be entered onto a tank cleaning record label to be posted on or adjacent to the tank. Such a label must be robust, and able to withstand contact with water.

Details of findings, actions taken and test results are to be entered onto the appropriate record keeping form [see Appendix 2]. Chlorination Certificates are to be obtained.

Any defects shall be reported immediately to the AP [W] / DAP [W].

Once a system has been filled, the Trust and / or its Contractors will not drain that system unless full disinfection is to be undertaken. Before the tank can be brought into service the Infection Control Team must certify the water as being of drinking water quality. The only exception is in the case of an emergency and with the consent of the AP [W] / DAP [W], acting on the advice of the Infection Control team.

6.2 Domestic Hot Water Systems

6.2.1 DHW Generator Flushing

Each DHW generator should be flushed quarterly through its drain valve by opening the drain valve three [3] times, each time for a one [1] minute period. Precautions to be taken to minimise the release of any aerosol (i.e., direct to drain for hoses/fixed pipes).

DHW generator flushing should be carried out after temperature checks on the DHW generator and system have been completed. The DHW generator blow down record sheet and DHW generator monthly temperature record sheet should be completed and returned to the AP [W] / DAP [W].

6.2.2 DHW Generator Maintenance

The cleaning procedure for DHW generator is as follows:

1. The DHW generator will be taken off line by isolating the service valves;
2. The DHW generator will be heated up until the contents have reached 70^{o}C and held at this temperature for a period of at least one [1] hour;
3. The DHW generator will be drained [the hose pipe outlet discharging below water level i.e., into a container of clean water]. The inspection hatch will be removed, where this is not possible a borescope camera will be used to complete an inspection. The drain down time is recorded and a photo of the internal condition is to be taken and held with the record sheet;
4. The DHW Generator will then be hosed out to remove any debris, scale or other deposit. Care will be taken to ensure that aerosols are kept to a minimum [If the DHW generator does not have an inspection hatch, the pipework at the top of the vessel should be disconnected to allow the insertion of a high pressure water hose (fed from a drinking supply) to allow debris to be washed down off internal surfaces];
5. The internal and external condition of the DHW Generator and pipework should be examined, any defects should be reported immediately to the AP [W] / DAP [W]. The safety valve should be checked, overhauled and re-set as necessary including temperature, altitude and pressure gauges to be checked;
6. The DHW Generator can then be re-constructed, ensuring that only materials and compounds approved in the Water Fittings and Materials Directory;
7. On completion of DHW generator assembly, the following sequence must be undertaken:
   a. Refill with cold water;
   b. Drain the DHW Generator;
   c. Refill with cold water, leave cold feed valve open;
   d. Run DHW generator at a temperature of 70^{o}C for at least one [1] hour. Test the operation of a high limit cut out system if fitted. Check the temperature of the DHW generator at the top and bottom with a touch thermometer;

e. Allow the system to cool down to the operating temperature and put the system back on line immediately;
f. Adjust any controls as necessary;
g. Complete the appropriate record keeping form [see Appendix 2].

6.3 Outlet Management

6.3.1 Point of use filters [POUF]

It is recognised that membrane point-of-use filters protect water supplies which are seeded with water borne pathogens [i.e., Legionella / *Pseudomonas aeruginosa*].

Generally, they will not be continually used in the long term.

In all cases the Infection Control Team will determine the necessity of such filters being fitted to outlets.

Where POUF are installed then a register [see appendix 2] of all installed filters shall be maintained, this will include the location of the filters, date installed and expiry date.

6.3.2 Showers / Spray taps

Showers are to be run daily by the ward / department as part of the daily cleaning procedure, including regular use as part of normal operation on the dept./ward.

Showers which are rarely used should preferably be removed, or run for a 3 [three] minute period once / twice per week. The removal of a shower will only proceed following consultation with the ICO [W].

Shower heads & hoses are replaced on a quarterly basis with new devices supplied from a manufacturer, the old devices are returned to the supplier for recycling. A register of all units shall be maintained along with their replacement [see appendix 2].

6.3.3 Thermostatic Mixing Valves [TMVs]

All TMVs shall be checked annually, where pre. TMV and outlet temperatures are checked including a failsafe check.

On an annual basis each TMV will be subject to a strip down and overhaul including temperature and failsafe check.

6.3.4 Little Used Outlets*

* Outlets include the following types: showers, baths, wash hand basins, sinks, WCs, sluices, bidets, and taps.

Normal daily operation of an outlet by staff, visitors, guest, patients and Facilities staff is considered regular use for an outlet.

Outlets which are rarely used [less than twice a week] should preferably be removed, or run / flushed once/twice a week for a 3 [three] minute period each occasion by designated person for the department/ward. Currently, all outlets are run 2x weekly irrespective of use by Facilities staff [excepting Augmented care areas – Daily] to negate the need to run individual outlets and records kept

An email may be issued by the RP [W] on a monthly basis to all wards / department managers to outline their responsibility for ensuring the daily use of all outlets. The email will advise where daily running is not achievable then management options must be adopted to manage the risk of stagnant water in the system, this may include placing the outlet on a once/twice weekly flushing programme including the completion of record form or the removal of the outlet/s and associated pipework.

6.3.5 Flexible Pipe Installations

When completing an installation all fittings will be made with fixed tails direct to the outlet.

Flexible tails for installations shall only be used when fixed tail installation is not possible on the following appliances: Hi – Lo bath / wash hand basins, washing machines and dishwashers. When flexible tails have been installed then a check valve shall also be fitted pre flexible tail.

6.3.6 Safe Purging of Stagnant Water

Stagnant water may potentially contain large numbers of water borne pathogens such as legionella. In order to avoid the risk of legionellosis, precautions are taken to avoid the creation of aerosols and to avoid the exposure of people to any unavoidable aerosols.
The specific precautions may vary according to the particular circumstances, but typically include:-

- Running a hose from the outlet into a container of clean water;
- Running hoses directly into a drain cover;
- Running fire hoses at a distance from occupied buildings;
- Closing windows and air conditioning intakes where aerosols are created outdoors;
- Wearing respiratory protective equipment *[remember this does not protect nearby members of the public and others who are not wearing masks]*.

Care should be taken to avoid the possibility of back siphonage into mains water supplies.

6.3.7 Length of Cut off Ends

Cut off ends should not exist. Where outlets or fittings are removed the supply pipe must be taken right back to the main supply with no 'cut off end' being left. On occasions, this is not always practicable, the maximum prescribed length of the cut off should not exceed twice the pipe diameter. The AP [W] / DAP [W] shall be consulted of any cut off ends required.

6.3.8 Length of DHW Returns for Outlets [Dead Legs]

All new domestic hot water systems shall be complete with a return pipe which shall run to within 50mm of any outlet or mixing valve. Where it is impractical to achieve this agreement shall be obtained by AP [W] / DAP [W] prior to installation.

Extensions or modifications to any existing hot water flow & return system shall also allow for the hot water return to run within 50mm of any outlet or mixing valve. Where this is impractical agreement shall be obtained by the AP [W] prior to installation.

On occasion the prescribed length of 50mm cannot always be achieved, the maximum length should not exceed 0.5 litres.

Existing single pipe hot water systems shall be modified to run above any new or relocated outlets to keep any dead legs to an absolute minimum and should not exceed 1.5 litres.

6.3.9 High Pressure Hoses

These units create considerable aerosol and as previously mentioned the use of such devices should be avoided. Where this is not possible then the water supply to such units must be from a wholesome water supply and have a suitable water category 5 protection [typically a type AA AB air gap and break tank]. The hose end of the device must not be inserted in a body of water whilst in or out of use to prevent back siphonage.

6.3.10 Anti-Ligature Taps

Anti-ligature taps include the following types:

- infra-red,
- tactile,
- push non-concussive.

These taps are installed for anti-ligature purposes. These types of taps bring with them water saving economies, which could impact on the turnover / through put of water being reduced when compared to a regular turn on / turn off tap. To ensure adequate through put of water from these taps each run time should be programmed for a minimum of thirty seconds whilst having the highest turnover possible [ideally turning over 6 litres of water in a minute].

As part of the cleaning regime the anti-ligature taps outlet and shower head outlets are sprayed with 'Presept' disinfectant solution once a week. These fittings require specialist tools to remove the diffusers, the once a week spray of the outlets will assist with reducing any potential build-up of dirt and contamination within the fittings. This process involves a contact time of 2 minutes on the outlet followed by 3 minute flush.

6.4 Plumbing Alterations

6.4.1 Minor Alterations

Where small alterations or maintenance tasks on water systems have been carried out, then re-commissioning may require no more than thorough flushing of the systems. This can be followed by sampling and analysis of the water if considered necessary by the AP [W] / DAP [W], although this is not expected to be required after minor maintenance-related works such as replacement of individual water fittings.

Disinfection should be completed for:

1. New installations (except private dwellings occupied by a single family); or
2. Major alterations (except private dwellings occupied by a single family); or
3. Underground pipework (except localised repairs or insertion of junctions); or
4. Where it is suspected that contamination may have occurred, e.g., fouling by sewage, drainage, animals or physical entry by site personnel for interior inspection, painting or repairs; or
5. Where a system has not been in regular use and not regularly flushed.

All fittings and pipe used on the installation are new and EITHER taken from the manufacturer's sealed packing just before use, OR pre-chlorinated immediately before use.

Pre-chlorination can be simply achieved by immersing and agitating the fittings for 5 minutes in a 1,000ppm solution of sodium hypochlorite / chlorine dioxide. The COSHH Regulations apply to the use of such solutions at work – a Risk Assessment should be prepared and the appropriate physical precautions must be taken.

To avoid the need to disinfect large systems following relatively minor extensions and alterations, it is recommended that biocide injection points are provided at the point where the new pipework joins the existing system. Biocide injection points take the form of valves,

tees and a drain valve or physically removable section of pipe. This enables biocide to be injected into the new section of pipework and circulated or drawn through all new fittings. The removable section must be taken out or the drain valve locked open to prevent any possibility of biocide [a Class 5 fluid] from contaminating the existing fresh water pipework during the disinfection process.

Work should only be undertaken by properly trained, experienced and qualified CP [W] or Contractors.

6.4.2 Major Plumbing Alterations

On larger installations or where fittings have been re-used and are not new and sealed, the new or altered section of pipework must be cleaned and disinfected by a specialist Contractor using an approved biocide, in accordance with BS EN 806 & BS 8558.

Major extensions and new buildings must be disinfected before being brought into use, and in many cases it may be more convenient for a specialist Contractor to disinfect the entire buildings systems from the tank or source.

Notification must be made to the Water Utility Company in accordance with the Water Supply [Water Fittings] Regulations 1999. Work should only be undertaken by properly trained, experienced and qualified CP [W] or Contractors who are members of WaterSafe.

6.5 Certification

In accordance with standard conditions of contract, the following Certificates should be obtained from the Contractor before new or significantly altered water systems are accepted at hand-over:

Certificate of Disinfection in accordance with BS EN 806 & BS 8558.
Results of water analysis from UKAS-accredited Laboratory.

6.6 Notifications

Under the Water Supply [Water Fittings] Regulations 1999 if any of the following are to be done or installed, the Water Utility Company must be notified before commencing the work:

1. Erection of a building or other structure;
2. Extension or alteration of a water system [other than in a dwelling];
3. Change of premises use;
4. Installation of any of the following, other than as a like-for-like replacement;
5. Bath of over 230 litres capacity;
6. Bidet;

7. Shower unit of a specified type;
8. Pump or booster;
9. Reverse osmosis unit;
10. Water treatment unit;
11. RPZ valve or other mechanical device [category 4 or 5 fluids];
12. Garden watering system;
13. Water system laid outside a building;
14. Construction of a pond or swimming pool;

The Water Utility Company has 10 days to grant or withhold consent and/or impose conditions. After 10 days have expired and nothing has been heard, consent is deemed to have been given. Approved contractors [members of 'Watermark' or similar approval schemes] are exempt from certain elements of the above, but on completion of the work they must send a copy of the Contractors Certificate to the Water Undertaking.

7 TRAINING/SUPPORT

Training requirements for DBTH staff responsible for the implementation of this procedural document are contained within the Trust Water Safety Policy (CORP/HSFS 18 v.5 – Water Safety Policy).

Any third party working in line with this procedural document must provide adequate evidence of training and competency to the relevant appointing Estates representative as outlined in the Trust's contractor management policy (CORP/HSFS 30 v.2 – Management of Contractors Policy and Procedures).

8 MONITORING COMPLIANCE WITH THE PROCEDURAL DOCUMENT

What is being Monitored	Who will carry out the Monitoring	How often	How Reviewed/ Where Reported to
Relevance of the procedural document to associated legislation and guidance.	Authorising Engineer (Water) DBTH Head of Estates	Ongoing assessment with a formal review every 3 years	Changes in legislation & guidance monitored quarterly by the Trust Water Safety Group Procedural document submitted to the Trust Water Safety Group for approval after any amendment.
General adherence to the procedural document	Authorising Engineer (Water)	Annual Audit	Audit report submitted to the Director of Estates & Facilities

			(Trust Responsible Person for Water)
Completion of planned preventative maintenance (PPM) measures outlined within the procedural document	Head of Estates	Quarterly	PPM completion data reported to the Trust Water Safety Group
Adherence to installation and commissioning requirements described within the procedural document	Relevant Estates representative	Upon completion of projects / work	Commissioning information retained on file within the relevant Operating and Maintenance (O&M) manual

9 DEFINITIONS

Ag/Cu	Silver/Copper
AE	Authorising Engineer
AP	Authorised Person
BMS	Building Management System
CP	Competent Person
COSHH	Control of Substances Hazardous to Health
DAP	Deputy Authorised Person
DHW	Domestic Hot Water
DIPC	Director of Infection Control
HTM	Health Technical Memorandum
ICO	Infection Control Officer
PPM	Planned Preventative Maintenance
RO	Reverse Osmosis
WRAS	Water Regulations Advisory Scheme
WSG	Water Safety Group
WSP	Water Safety Plan

10 EQUALITY IMPACT ASSESSMENT

The Trust aims to design and implement services, policies and measures that meet the diverse needs of our service, population and workforce, ensuring that none are disadvantaged over others. Our objectives and responsibilities relating to equality and diversity are outlined within our equality schemes. When considering the needs and assessing the impact of a procedural document any discriminatory factors must be identified.

An Equality Impact Assessment (EIA) has been conducted on this procedural document in line with the principles of the Equality Analysis Policy (CORP/EMP 27) and the Fair Treatment for All Policy (CORP/EMP 4).

The purpose of the EIA is to minimise and if possible remove any disproportionate impact on employees on the grounds of race, sex, disability, age, sexual orientation or religious belief. No detriment was identified. (See Appendix 6)

11 ASSOCIATED TRUST PROCEDURAL DOCUMENTS

CORP/HSFS 18 v.5 – Water Safety Policy
CORP/HSFS 30 v.2 – Management of Contractors Policy and Procedures

12 DATA PROTECTION

Any personal data processing associated with this policy will be carried out under 'Current data protection legislation' as in the Data Protection Act 2018 and the UK General Data Protection Regulation (GDPR) 2021.

For further information on data processing carried out by the trust, please refer to our Privacy Notices and other information which you can find on the trust website: https://www.dbth.nhs.uk/about-us/our-publications/information-governance/

13 REFERENCES

Approved Code of Practice, Legionnaires' disease: the control of Legionella bacteria in water systems. [L8 rev 4]: 2013

BS 7592:2008 - Description: Sampling for Legionella bacteria in water systems. Code of practice

BS8680:2020 Water Quality – Water Safety Plans – Code of Practice

Health Technical Memorandum 03-01: Specialised ventilation for healthcare premises. Part A, 2006

Health Technical Memorandum 03-01: Specialised ventilation for healthcare premises. Part B, 2006

Health Technical Memorandum 04-01: Safe Water in Healthcare Premises. Part A, 2016

Health Technical Memorandum 04-01: Safe Water in Healthcare Premises. Part B, 2016

Health Technical Memorandum 04-01: Safe Water in Healthcare Premises. Part C, 2016

Health Technical Memorandum 04-01: Safe Water in Healthcare Premises. Supplement - performance specification D 08: thermostatic mixing valves (healthcare premises), 2015

HSG274 – Part 1: The control of legionella bacteria in evaporative cooling

HSG274 – Part 2: The control of legionella bacteria in hot and cold water systems

HSG274 – Part 1: The control of legionella bacteria in other risk systems

The Health & Social Care Act 2008.

The Health and Safety at Work etc. Act: 1974

The Management of Health and Safety at Work Regulations: 1999

The Water Supply [Water Fittings] Regulations: 1999

The Water Supply [Water Quality] Regulations: 2000

The Control of Substances Hazardous to Health Regulations: 2002

The Building Regulations: 1992

Water Regulations Advisory Scheme [WRAS] Water Regulations Guide: 2004

Water Regulations Advisory Scheme [WRAS] Water Fittings and Materials Guide: 2005

APPENDIX 1 – PPM SUMMARY CHECKLIST

System/Service	Task	Frequency	Undertaken by
Calorifiers [Water storage units]	Inspect calorifier internally by removing the inspection hatch or using a borescope, and clean by draining the vessel. The frequency of inspection and cleaning should be subject to the findings and be increased or decreased based on conditions recorded	Annually, or as indicated by the rate of fouling	MMH no Cals, DRI in house, BDGH – contracted out
Calorifiers [Water storage units]	Where there is no inspection hatch, purge any debris in the base of the calorifier to a suitable drain Collect the initial flush from the base of hot water heaters to inspect clarity, quantity of debris and temperature	Annually, but may be more frequent as indicated by the risk assessment or result of inspection findings	Contracted out all sites
Calorifiers [Water storage units]	Check calorifier flow temperatures (thermostat settings should modulate as close to 60°C as practicable without going below 60°C) Check calorifier return temperatures (not below 50°C).	Monthly	Contracted out all sites
Hot water services	For non-circulating systems: take temperatures at sentinel points (nearest outlet, furthest outlet and long branches to outlets) to confirm they are at a minimum of 55°C within one minute	Monthly	Contracted out all sites
Hot water services	For circulating systems: take temperatures at return legs of principal loops (sentinel points) to confirm they are at a minimum of 55°C. Temperature measurements may be taken on the surface of metallic pipework	Monthly	Contracted out all sites
Hot water services	For circulating systems: take temperatures at return legs of subordinate loops; temperature measurements can be taken on the surface of pipes, but where this is not practicable, the temperature of water from the last outlet on each loop may be measured, and this should be greater than 55°C within one minute of running. If the temperature rise is slow, it should be confirmed that the outlet is on a long leg and not that the flow and return has failed in that local area	Quarterly (ideally on a rolling monthly rota)	Contracted out all sites
Hot water services	All HWS systems: take temperatures at a representative selection of other points (intermediate outlets of single pipe systems and tertiary loops in circulating systems) to confirm they are at a minimum of 55°C to create a temperature profile of the whole system over a defined time period	Representative selection of other sentinel outlets considered on a rotational basis to ensure the whole system is reaching satisfactory temperatures	Contracted out all sites
POU water heaters (no greater than 15 litres)	Check water temperatures to confirm the heater operates at 55°C, or check the installation has a high turnover	Monthly–six monthly, or as indicated by the risk assessment	Contracted out all sites – but very limited POU fitted

Combination water heaters	Inspect the integral cold water header tanks as part of the cold water storage tank inspection regime; clean and disinfect as necessary. If evidence shows that the unit regularly overflows hot water into the integral cold water header tank, instigate a temperature-monitoring regime to determine the frequency, and take precautionary measures as determined by the findings of this monitoring regime	Annually	Not present
Combination water heaters	Check water temperatures at an outlet to confirm the heater operates at 55°C	Monthly	Not present
Cold water storage cisterns	Inspect cold water storage cisterns and carry out remedial work where necessary	Annually	Inspection contracted – DBTH action remedial
Cold water storage cisterns	Check the cistern's water temperature remote from the ball valve and the incoming mains temperature. Record the maximum temperatures of the stored and supply water recorded by fixed maximum/minimum thermometers where fitted.	Annually (summer) or as indicated by the temperature profiling	Contracted out all sites
Cold water services	Check temperatures at sentinel taps (typically those nearest to and furthest from the cold cistern, but may also include other key locations on long branches to zones or floor levels). These outlets should be below 20°C within two minutes of running the cold tap. To identify any local heat gain, which might not be apparent after one minute, observe the thermometer reading during flushing	Monthly	Contracted out all sites
Cold water services	Take temperatures at a representative selection of other points to confirm they are below 20°C to create a temperature profile of the whole system over a defined time period. Peak temperatures or any temperatures that are slow to fall should be an indicator of a localised problem	Representative selection of other sentinel outlets considered on a rotational basis to ensure the whole system is reaching satisfactory temperatures for *Legionella* control	Contracted out all sites
Cold water services	Check thermal insulation to ensure it is intact, and consider weatherproofing where components are exposed to the outdoor environment	Annually	Not currently completed – ad-hoc repairs
Showers and spray taps	Dismantle, clean, descale and disinfect removable parts, heads, inserts and hoses where fitted	Quarterly or as indicated by the rate of fouling or other risk factors, e.g. areas with high-risk patients	Contracted out all sites
POU filters	Record the service start date and lifespan or end date and replace filters as recommended by the manufacturer (bacterial-retention filters should be used primarily as a temporary control measure while a permanent solution is developed, although long-term use of such filters may be needed in some healthcare applications)	According to manufacturer's guidelines	DBTH - all sites

Base exchange softeners	Visually check the salt levels and top up salt, if required. Undertake a hardness check to confirm operation of the softener	Weekly, but depends on the size of the vessel and the rate of salt consumption	DBTH – all sites
Base exchange softeners	Service and disinfect	Annually, or according to manufacturer's guidelines	Contracted out
Infrequently used outlets	Consideration should be given to removing infrequently used showers, taps and any associated equipment that uses water. If removed, any redundant supply pipework should be cut back as far as possible to a common supply (e.g. to the recirculating pipework or the pipework supplying a more frequently used upstream fitting) but preferably by removing the feeding 'T' Infrequently used equipment within a water system (i.e. not used for a period equal to or greater than seven days) should be included on the flushing regime Flush the outlets until the temperature at the outlet stabilises and is comparable to supply water and purge to drain Regularly use the outlets to minimise the risk from microbial growth in the peripheral parts of the water system, sustain and log this procedure once started	Weekly, or as indicated by the risk assessment	DBTH Trust policy is to flush all outlets twice weekly, [not just little used outlets.] Undertaken by DBTH Facilities team.
TMVs	Where integral, inspect, clean, descale and disinfect any strainers or filters associated with TMVs. To maintain protection against scald risk, TMVs require regular routine maintenance carried out by competent persons in accordance with the manufacturer's instructions. There is further information in paragraphs 2.152–2.168 of HSG274 Part 2.	Annually or on a frequency defined by the risk assessment, taking account of any manufacturer's recommendations	BDGH – in house DRI/MMH – contracted out
Inline strainers	Where fitted, inspect, clean, descale and disinfect any strainers or filters associated with TMVs or other sensitive equipment.	Annually or on a frequency defined by the risk assessment, taking account of any manufacturer's recommendations	As above when associated with TMV's – otherwise not done
Pressurisation and expansion vessels	Where practical, flush through and purge to drain. Where removable, bladders or diaphragms should be changed according to the manufacturer's guidelines or as indicated by the risk assessment	Monthly–six monthly, as indicated by the risk assessment	Not currently undertaken.
Biocidal treatment systems	Check the dosing and control system operation including alarms	Weekly	BDGH – In house DRI – In House MMH – In House
Biocidal treatment systems	Measure the treatment parameters to establish the required values are	Monthly	DRI – Contracted out

	being achieved at representative outlets including sentinel outlets Note: Consider 24-hour automatic monitoring for biocidal treatment on large or complex systems	Validation and calibration of the automatic monitoring system should be carried out at the frequencies recommended by the manufacturer	MMH – Contracted out BDGH – Contracted out

APPENDIX 2 – WATER SYSTEM DESIGN CHECKLIST

Checklist for Water System Designs or Alterations

Scheme:	Project Manager:	Yes/No	Signed / Dated
1	If altering an existing system, has the impact of the alterations on the system been assessed to ensure safe systems at all times?		
2	If you are fitting a new system, do any of the materials or fittings used in the water systems support the growth of micro-organisms?		
3	Are low corrosion materials used?		
4	Do materials and designs comply with the "Water Supply (Water Fittings), Regulations"? Certificate to be supplied confirming so.		
5	If fitted, are thermostatic mixing valves [TMV's] sited as close as possible to the point of use?		
6	Are all water temperatures at all outlets greater than 55^{O}C for hot water outlets (un-mixed, or to the mixer) within 1 minute of running and at under 20°C for cold water outlets within 2 minutes of running? Contractor to confirm.		
7	Are all new systems commissioned appropriately in accordance with L8, HTM04:01 and BSRIA & CIBSE best practice? Is stagnation avoided? Contractor to certificate to this extent.		
Design and construction: Cold water system			
8	Are low use outlets installed upstream of higher use outlets?		
9	Has cold water storage been assessed and minimised, i.e. holds enough for a day's use only?		
10	Is piping insulated and kept away from heat sources [where possible]?		
11	Is the cold water tank:		
	[i] fitted with a cover and insect screen[s] on any pipework open to the atmosphere?		
	[ii] located in a cool place and protected from extremes of temperature?		
	[iii] accessible?		
Design and construction: Hot water system			
12	Does the DHW generator storage capacity meet normal daily fluctuations in hot water use while maintaining a supply temperature of at least 60^{o}C at the DHW generator and at least 55^{o}C at the outlets and 55^{o}C at the return? **		
13	Are the hot water distribution pipes insulated?		
14	If more than one DHW generator is used, are they connected in parallel?		
15	Does the DHW generator have the following fitted:		
	[i] a drain valve?		
	[ii] a temperature gauge on the inlet and outlet?		
	[iii] an access panel?		
	[vi] Non return valves fitted to the cold and return feeds?		
	[v] Are fitted with de-stratification loops which are set to run for 1 hr each day.		
16	Have all return legs on the hot water circulation system been monitored to ensure they remain above 55^{O}C at all times?		
17	Are all domestic hot water full temperature legs less than 1m in length? All reduced temperature legs less than 2m in length?		

** Each system to be logged to ensure that under prolonged continuous demand to ensure the following:
The flow temperature does not fall below 60^{O}C on more than two occasions for more than 20 minutes in one 24 hour period.
The return temperature should always be greater than 55^{O}C.
There should never be more than 10 Deg. Difference between flow and return temperatures.
Cold water temperature should be <20^{O}C.
The system must achieve 60^{O}C for at least one hour each day throughout the entire vessel (base to top).

APPENDIX 3 – CU/AG IONISATION SYSTEM RAMS


RA2 Risk assessment samplin


OP3 Sampling procedure (1).pdf


OP4 Maintenance procedure-2 (1).pdf

Note: Embedded document – contact Estates department for a copy of these documents if viewing as a pdf

APPENDIX 4 – WATER HYGIENE CONTRACTOR RAMS


BIO.RAMS Calorifiers, Domesti


BIO.RAMS Borehole Water Sampling Do


SHOWERHEAD PLUS COSHH Asses

Note: Embedded document – contact Estates department for a copy of these documents if viewing as a pdf

APPENDIX 5 - DBTH BIRTHING POOL GUIDANCE


MSG 19 Waterbirth May 2012.pdf

Note: Embedded document – contact Estates department for a copy of these documents if viewing as a pdf

APPENDIX 6 - EQUALITY IMPACT ASSESSMENT PART 1 INITIAL SCREENING

Service/Function/Policy/Project/ Strategy	Division	Assessor (s)	New or Existing Service or Policy?	Date of Assessment
DBTH Water Safety Plan Operations and Procedures Manual (WSP/Tech)	Estates & Facilities	Matt Gleadall	New Procedural Document	15/11/2021

1) Who is responsible for this policy? Name of Division/Directorate: Estates & Facilities – Estates Department

2) Describe the purpose of the service / function / policy / project/ strategy? Procedural document outlining action to maintain water safety on site

3) Are there any associated objectives? Legislation, targets national expectation, standards: Contributes to compliance with the Health & Safety at Work Act (1974), the COSHH Regulations (2002), HTM 04-01 (Parts A, B & C) and the HSE's Approved Code of Practice L8 – The control of legionella bacteria in water systems

4) What factors contribute or detract from achieving intended outcomes? – Staff awareness of the procedural document, effective implementation of the procedures by Trust personnel

5) Does the policy have an impact in terms of age, race, disability, gender, gender reassignment, sexual orientation, marriage/civil partnership, maternity/pregnancy and religion/belief? Details: [see Equality Impact Assessment Guidance] – No

- **If yes, please describe current or planned activities to address the impact** [e.g. Monitoring, consultation] – N/A

6) Is there any scope for new measures which would promote equality? [any actions to be taken] No

7) Are any of the following groups adversely affected by the policy?

Protected Characteristics	Affected?	Impact
a) Age	No	
b) Disability	No	
c) Gender	No	
d) Gender Reassignment	No	
e) Marriage/Civil Partnership	No	
f) Maternity/Pregnancy	No	
g) Race	No	
h) Religion/Belief	No	
i) Sexual Orientation	No	

8) Provide the Equality Rating of the service / function /policy / project / strategy – tick (✓) outcome box

Outcome 1 ✓	Outcome 2	Outcome 3	Outcome 4

Date for next review: November 2024

Checked by: Howard Timms **Date:** 15/11/2021