Nottingham University Hospitals NHS
NHS Trust

LEGIONELLA MANAGEMENT AND CONTROL PROCEDURES

Documentation Control

Reference	HS/EI/024
Approving Body	Directors' Group
Date Approved	8 May 2014
Implementation date	22 May 2014
Version	2
Summary of Changes from Previous Version	Changes to Legislation
Supersedes	Version 1 (January 2012)
Consultation undertaken	Directorate of Estates and Facilities Management, Legionella & Water Safety Steering Group, Estates Legionella Control Teams, ORC, Trust Health and Safety Committee, Directors Group
Date of Completion of Equality Impact Assessment	6 February 2013
Date of Completion of We Are Here for You Assessment	6 February 2013
Date of Environmental Impact Assessment	6 February 2013
Legal and/or Accreditation Implications	Approved Code of Practice (L8) Legionnaires Disease 'The Control of Legionella Bacteria in Water Systems
Target audience	All Trust staff, occupiers of Trust premises and contractors
Review Date	May 2015
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1 LEGIONELLA MANAGEMENT AND CONTROL PROCEDURES

1.1 Introduction

It is the responsibility of any person employed by the Trust in whatever capacity including Service Level Agreement's (SLA) to comply with the requirements of this Procedural Document.

This Procedural Document must be used in conjunction with the current version of the Trust's Legionella Management & Control Policy HS/EI/004.

This Procedural Document provides the infrastructure for the implementation of the Trust's Legionellosis Management & Control Programme. It is expected that this Procedural Document be complied with by Trust employees, occupiers on all Trust sites, and by all appointed contractors, in whatever capacity, with or without contractual agreements.

Management procedures will seek to ensure that compliance with this Procedural Document is continuing and it is not notional.

As part of the Trust's commitment to provide a fully compliant service, it is necessary that all regular tests and checks set out in this document shall be carried out even if they cause minor disruption to hospital services and that comprehensive records will be maintained.

1.2 Glossary of Terms

AHU	Air Handling Units
CWS	Cold Water System
DWS	Domestic Water System
EOT	Estates Operations Team
HWS	Hot Water System
TMT	Thermostatic Mixer Taps
TMV	Thermostatic Mixer Valve
MCWS	Mains Cold Water Systems
RPZ	Reduced Pressure Zone
AE	Authorising Engineer
AP	Authorised Person
BCP	Business Continuity Plans
CHC	City Hospital Campus
DP	Designated Person
HBN	Health Building Note
HFN	Health Facility Note
HGN	Health Guidance Note
HTM	Health Technical Memorandum
IPCT	Infection Prevention Control Team
PPM	Planned Preventative Maintenance
PTW	Permit to Work
QMC	Queens Medical Centre
SLA	Service Level Agreement
CIBSE	Chartered Institute of Building Services Engineers

1.3 Primary Method of Bacterial Control

The Trust employs "Temperature Control" as the primary method of biological control, to manage and control the risk of bacterial proliferation. This is achieved by maintaining cold water at temperatures of less than 20°C, stored hot water at temperatures of greater than 60°C and distributed hot water at greater than 55°C at the return.

In addition to the primary method of control, the Trust will also use Chlorine Dioxide dosing, at various parts of the site, as an additional control measure. The areas that currently use Chlorine Dioxide are listed in Appendix A.

In order to ensure maximum efficiency of the control measures employed, it is important to keep all systems clean and well used at all times and at the correct temperatures.

During specific circumstances, such as when the primary method of bacterial control is shown by the various Planned Preventative Maintenance (PPM) Programme Monitoring Tasks to be failing, the water quality shall be maintained by the use of shot-dosing of a suitable disinfecting agent (disinfection). The levels of which must be maintained within the recommended limits for achieving disinfection as specified within the current edition of BS6700: 2006 Clause 6.1.10.4:2006 and L8 – The Control of Legionella Bacteria in Water Systems – Approved Code of Practice & Guidance 2001.

Estates Operations will continue to consider new developments and improvements in the field of Legionellosis Management & Control, in order to ensure that the control of the prevailing risk of Legionellosis posed by the systems on sites are constantly reviewed and improved and always maintained at the maximum level.

1.4 Scope

The scope of this Procedural Document shall extend to but not be limited to:

- Domestic Cold Water Services – Storage and Distribution
- Domestic Hot Water Services - Generation Storage and distribution
- Faucets, Showers, Bib taps, etc.
- Thermostatic Mixing Valves (TMV) / Thermostatic Mixing Taps (TMT)
- Drinking Fountains
- Vending Machines
- Humidified Food Cabinets
- Ornamental Fountains/Ornamental Water Displays
- Irrigation Systems
- Fire Fighting Systems
- Hydrotherapy Pools
- Emergency Showers/ Eye Washers
- Dental Chairs
- Nebulisers
- Humidified Incubators
- Wet Air Conditioning
- Portable Humidifiers
- Portable Air Conditioning Units
- Humidified Chambers
- Lathes / Cutting Tools
- Ground / Floor Wash Vehicles
- Cooling Towers & Evaporative Condensers
- Adiabatic Cooling Systems

2 SYSTEM/PLANT DESIGN, INSTALLATION AND MAINTENANCE (CAPITAL & MAINTENANCE WORKS)

This section identifies the preferred equipment and suppliers servicing Nottingham University Hospitals NHS Trust.

In addition to making reference to standards and guidelines, this section also confirms some general requirements regarding the environment in which the equipment may be installed, generating some 'best practice' principles.

As a minimum Sections 2, 3, 6 and 8 shall be issued to design teams and contractors for reference on projects and/or maintenance visits.

2.1 General Design and Installation Considerations

Systems which utilise or contain water and can affect the water supply, the atmosphere and the user, shall be monitored regularly and be subjected to the following regime:

All designs must be carried out and presented in accordance with all relevant and current Guidelines, European and British Standards, "best-practices", Health Technical Memoranda, Health Guidance Notes and National Health Service Model engineering specifications.

The systems shall be carefully designed to eliminate or minimise aerosol production and excessive water retention. They must also be designed to be readily drained and cleaned.

No materials used in construction shall include those that are known to harbour or provide nutrient for bacteria. Any materials that come into contact with the water in a hot or cold water installation shall comply with the requirements of the Water Supply (Water Fittings) Regulations 1999. The list of products and materials that have been assessed for compliance with the Water Supply (Water Fittings) Regulations 1999 requirements are listed in the current edition of Water Fittings and Materials Directory that is updated every six months. Further information on the selection of materials can be found in BS6700:2006 and BS6920-4:2001 and HTM04-01.

All TMVs installed must be compliant with the National Health Service Model engineering specifications D08 Thermostatic mixing valves (Healthcare Premises) and the TMV3 Approved Scheme and installed in accordance with all relevant and current Guidelines, European and British Standards, "best-practices", Health Technical Memoranda, Health Guidance Notes and National Health Service Model engineering specifications.

It is the Trust's policy that **no** flexible hoses shall be fitted to any new buildings or refurbishments commissioned by or on behalf of the Trust.

Where flexible hoses must be used (e.g. on essential equipment such as hi-low baths) they must be lined with a suitable alternative to EPDM, as well as being Water Regulations Advisory Scheme (WRAS) approved. Care shall be taken to avoid kinking or distorting them during installation.

Risk assessments shall be reviewed regularly and whenever there are changes to the patient user group or alterations made to the potable water system.

Enquiries regarding specific types of flexible hose shall be directed to the manufacturer/supplier.

Water supplies to certain specialist units such as maternity, neo-natal paediatric, general paediatric and renal dialysis units (see the Renal Association, 2002) shall be monitored to ensure that water quality is within acceptable limits.

Where water supplies are required for specialist systems such as endoscope cleaning installations, dialysis units etc, the designer shall consult the IPCT to establish any specific water treatment requirements for the process, and also the local water undertaker to clarify any special precautions that may be necessary, such as backflow prevention devices. The advice of the water undertaker shall also be sought as to any possible variation in the quality of supply or

possible change in the source of supply (see Health Building Note 53 – 'Facilities for renal services: Volume 1 − Satellite dialysis unit').

Documented and anecdotal evidence suggests that some infants and young children who drink water containing chlorine dioxide in excess of the Maximum Recommended Daily Level (MRDL) could experience nervous system effects. Similar effects may occur in foetuses of pregnant women who drink water containing chlorine dioxide in excess of the MRDL. Some people may experience anaemia. This evidence also suggests that violations of the MRDL may harm human health based on short-term exposures. Certain groups, including foetuses, infants, and young children, may be especially susceptible to nervous system effects from excessive chlorine dioxide exposure. There are no obvious symptoms, but chlorine dioxide can affect development of the nervous system. Water, juice, and formula for young children and for pregnant women shall not be prepared with tap water which is treated with chlorine dioxide. Instead, a separate non-treated supply (preferably a direct mains supply) shall be provided for this purpose. Because the potential health effects of chlorine dioxide are based on tests on laboratory animals, there is no way to determine at exactly what age for young children the water is safe to drink. Adults who are not pregnant can drink the tap water because their nervous systems are already developed.

In addition, Chlorine Dioxide and its breakdown products chlorite and chlorate can be deleterious to renal dialysis patients and shall be removed from the water supply to these units.

The systems shall be maintained in a clean and sound condition and must be easily and safely accessible.

All systems shall be frequently used (at least Daily), or suitably flushed to simulate the necessary usage frequency, in order to avoid stagnant water which will increase the potential of bacterial growth and proliferation. The Estates Operations Team shall support the "users" of buildings such that they can undertake regular assessments of usage frequency implement control measures and provide information to the Estates Operations Team to confirm that the correct actions are regularly monitored and reported upon.

Where an area is occupied for less than 7days/week, the 'Users' shall include as part of their assessment the risks from not using the systems on unoccupied days and the precautions required on operating the system after regular periods of stagnation

All plant and distribution pipe-work (where accessible) shall be clearly labelled.

2.2 General Design and Installation Independent Advice

The Trust's Independent Legionella Consultants shall provide input advice to the design process in respect to the construction/installation phase and for the subsequent operational service thereafter.

In conjunction with the appointed design engineer the Trust's Independent Legionella Consultants shall contribute to the design process, to ensure all water and air systems, implicated within the design remit, comply with the requirements of BS6700:2006, L8 and HTM 04-01.

The Trust's Independent Legionella Consultants shall provide an updated risk assessment and certificate of compliance for new water systems including major modifications/refurbishments. The risk assessment shall be carried out upon commissioning of project and prior to occupation.

The risk assessment must be carried out with the systems being fully operational and maintained at the required recommended operating temperatures. The risk assessment shall include risk analysis as set out in Section 3.

2.3 Cold Water Storage Tanks

Cold water storage tanks shall be constructed from non-deleterious materials which must be WRAS approved.

Cold water storage tanks shall be designed and installed in accordance with the current Water Supply (Water Fittings) Regulations 1999 and installed in appropriate and suitable locations to allow easy and safe access to facilitate inspection and maintenance.

Sectional Cold Water Storage tanks shall be designed with external assembly flanges and self-draining profiles, since this arrangement facilitates easy cleaning of internal surfaces.

Externally located Cold water storage tanks shall be suitably protected from environmental conditions, particularly the local high ambient temperatures for all new buildings and, where practicable, for existing installations.

Cold water storage tanks shall be protected from the ingress of light, insects and birds.

Cold water storage tanks shall be sized and arranged so as to minimise retention time of stored water (24hrs maximum), and therefore to increase the rate of stored water exchange.

Cold water storage tanks shall be subjected to a periodic "need" test which requires the user/ Estates Operations Team to question the presence of each unit and consider its removal if the services it supplies can be, equally well, supplied by converting the systems to domestic Mains fed only.

Each unit shall be subjected to a periodic "drop-test" designed to ascertain the capacity and demand requirements of each system, in order to ensure that excessive volumes of water are not unnecessarily stored. Eliminating storage within a system would also allow the negation of the necessary PPM Programme tasks and their replacement with much less onerous, more infrequent and less costly tasks to be carried out.

All associated pipework and valves shall be adequately insulated and clearly labelled to identify their purpose.

Delayed-action ball valves shall be fitted (where practicable) in order to help avoid stagnation of water.

Where Cold water storage tanks are linked "in parallel", the feed to each tank shall be fitted with a water meter in order to allow for confirmation of equal and uniform usage from all tanks in the configuration.

Various arrangements of pumping systems are indicated in BS6700:2006. Where booster pumps are to be installed, a break cistern will be required between the mains supply pipe and the pumps. This is required in order to comply with the Water Supply (Water Fittings) Regulations 1999 with regard to prevention of backflow. Control of the pump(s) shall be fully automatic in operation and controlled by pressure sensors. Where two or more pumps are installed, the design flow shall be achieved with one pump stationary (or out of service). Automatic control shall be provided to cyclically and sequentially control all pumps to ensure that each is regularly brought into service. If this is not possible, documented procedures shall be in place to ensure equal usage is achieved.

Cold water storage tanks shall be maintained in good condition, clean from excessive corrosion, sludge deposition and scale deposition.

Stored water shall be maintained at a temperature of <20°C (or no more than 2°C greater than the inlet supply temperature to the building).

Where indicated and when it is deemed necessary and practicable, Cold Water Storage Tanks shall be upgraded, refurbished, modified or replaced so that they may comply with current Water Supply (Water Fittings) Regulations 1999. Following these works, each tank shall be cleaned and disinfected in accordance with BS6700:2006 and L8 prior to it being allowed back into service.

Cold Water Storage Tanks shall be subjected to periodic monitoring to include:

- Temperature monitoring.
- General physical inspections.

Cold Water Storage Tanks shall be subjected to a clean and disinfection when the results of the monitoring indicate the need.

2.4 Hot Water Calorifiers

Calorifiers shall be installed in appropriate and suitable locations to allow easy and safe access to facilitate inspection and maintenance.

Where more than one Calorifier or heating device is used, they shall be connected in parallel, taking care to ensure that the flow can be balanced so that the water temperature from all the Calorifiers exceeds 60°C at all times.

The combined storage capacity and heater output must be sufficient to ensure that the outflow temperature, at continuous design flow (at least 20 minutes) from calorifiers or other heaters, shall not be less than 60°C. This applies to both circulating and non-circulating hot water systems.

The positioning of the control and high limit thermostats, cold feed and return water connections must ensure that these temperatures are achieved.

Action shall be taken to prevent warm water entering the cold-feed and a check valve shall be provided in the cold feed as close to the calorifier as practicable, to prevent such circulation. However, the installation of such a check valve shall not be carried out in systems that use the cold feed for expansion. In these cases U-bend or S-bend's shall be installed in the cold-feed, sufficient distance from the connection to the calorifier so that water which is warm is not displaced (on heating up) beyond the bend and the vertical pipe rise.

Doubts have been expressed about the desirability of using single entry pressurisation/expansion vessels on cold water systems. The use of single entry pressurisation vessels effectively forms a vertical dead-leg through which there is no flow of water and concern has been expressed about the possibility of bacterial growth within the vessel. It is considered preferable therefore, that a pressurisation vessel with both inlet and outlet connections shall be installed, wherever practicable, so that the water content of the vessel is constantly changed. This will also allow for compliance with BS ISO6144:2006 and BS6920-4:2001. Where pressurisation vessels are of the single entry type they must be fitted with appropriate drain valves to facilitate flushing of the unit on at least a weekly basis. All vessels shall be flushed at least weekly for long enough to ensure adequate replacement of its contents.

Care must be taken to avoid damage to the diaphragm.

The practice of terminating the air vent over the Water Storage Tank shall not be allowed. The vent shall be arranged to discharge over a separate tun-dish arrangement, with visible Type A air gap, sited at a level that takes account of the hydrostatic head of the system. The calorifier or water heater shall be provided with a suitable safety valve of appropriate size and vacuum release arrangement.

Where water quality indicates the need, cathodic protection from galvanic action by means of sacrificial anodes shall be provided.

Calorifiers shall be fitted with a de-stratification pump, where necessary, in order to avoid temperature stratification of the stored water. Some semi-storage/high-efficiency Calorifiers are supplied with an integral pump that circulates water in the Calorifier. De-stratification pumps shall not be fitted to this type of units.

A single circulating pump shall normally be installed in the return. If, for reasons of reliability, two pumps are installed in parallel they shall be arranged to have individual non-return and service valves and be controlled such that each one is brought into operation twice a day.

When Calorifiers are isolated from the system (for whatever reason), the associated distribution system shall be subjected to DAILY flushing. However, this is only necessary when the Calorifier isolated is the sole supply of Hot Water Services (HWS) to that distribution system. Where more than one Calorifier supplies the distribution services, the isolated calorifier shall be drained down and remain drained whilst off line.

A suitably sized drain shall be connected to the base of each calorifier (where practicable).

Calorifiers shall be maintained at the following temperature profiles at all times:

- "Stored" and "Flow" at ≥60.0^{o}C
- "Return" at ≥55°C
- "Distribution" at ≥50°C
- "Drain" at ≥50°C

In order to ensure that the temperatures required to achieve thermal disinfection (≥60ºC for the "Flow" and ≥50ºC for "Distribution") are maintained, it is important to ensure that:

- Ideally, the Calorifiers shall be allowed to operate continuously ensuring that the heat source is available constantly. Where the Primary Heating Source is not set by a timer, the heating source shall be left 'on' at all times.

- Where the Timers are fitted and operated and cannot be removed, it is important to ensure that the units are allowed to operate at a temperature of >60ºc for at least 1 hour from, when they come 'on line', before any water is drawn from them.

- Where a building is to remain un-occupied, the calorifier shall be emptied and pasteurised before being allowed back 'on-line'.

Calorifiers shall be subjected to regular check for "Flow" and "Return" temperature. This shall be carried out remotely via the Building Management System (BMS).

Combination water heaters shall be maintained such that the cold tank part of the heater is kept clean and at the correct temperature, and the hot tank part maintained at a temperature of >60.0^{o}C allowing for distribution temperatures of >50.0^{o}C. A screened vent and an insect/rodent overflow screen shall be fitted to the tank part of the units.

Instant water heaters, including combination boilers, usually store small water volumes, and because of this they do not usually need to be operated within the temperature profile and limits prescribed for larger systems (≥60°C for the 'flow' and (≥50°C for the 'return' and 'outlet') which are necessary for thermal disinfection. These units can, therefore, be operated at "safe" temperatures of ≤41.0^{o}C although they shall be switched-on at all times to ensure and encourage adequate use. Infrequent use of these units (less than Daily) would increase the potential of bacterial growth and proliferation (as would be the case in all infrequently used areas throughout the system – both hot and cold), although particularly in this case because of the low temperatures where operated.

Calorifiers shall be subjected to regular inspections for Water Quality, Calorifier physical condition, Temperature and Bacterial activity.

Calorifiers shall be subjected to a regular blow-down and flush via the drain point

Cleaning, flushing and pasteurisation shall be carried out in the event of major modifications or after a period out of service, before a Calorifier is returned to service. Pasteurisation shall also be carried out when the stored water temperature falls below 45°C for more than 1 hour before the Calorifier is returned to service.

Return and shunt pumps shall be overhauled on an annual basis (where this is a stated requirement) or shall be serviced and maintained to manufactures specifications.

2.5 Hot Water and Cold Water Distribution Systems

The design and installation of the hot and cold water distribution system shall comply with the Water Supply (Water Fittings) Regulations 1999 and BS6700:2006.

The design of the pipework shall ensure that there is no possibility of a cross-connection between installations conveying potable water and an installation containing non-potable water or water supplied from a private source (untreated). There shall be no possibility of backflow towards the source of supply from any tank, cistern or appliance, whether by back siphonage or otherwise.

All cold distribution pipework, mains and tank down feeds shall be located, as far as is practicable, to minimise heat gains from their environment. Pipework shall not be routed through hot ducts or run adjacent to heat sources, such as radiators.

All pipework shall be insulated, except for any exposed final connections to facilities, and shall be arranged to eliminate or minimise dead-legs.

As far as possible, the objective shall be to design the cold water systems to ensure that the inlet, outlet and surface water temperatures of cold water storage tanks are not greater than 2°C above that measured at the main water meter. Also, at cold water draw-off points, a temperature of not greater than 2°C above the temperature measured in the source Cold water storage tanks shall be reached within one minute.

Stagnation shall be avoided. Hot and cold water services shall be sized to provide sufficient flow at draw-off points. The aim shall be to promote turnover of water by means of; the design of the distribution circuitry, adequate usage and avoidance of “disused” areas.

Where biological results indicate significant local bacterial contamination and the contaminated outlet cannot be taken out of use for clinical reasons, the contaminated outlet shall be fitted with a suitable Point-of-Use filter to enable continued use of the facility. Where such filters are fitted, they shall be changed according to manufacturer’s instructions.

Where practicable; separate drinking water systems shall be provided directly from the mains without storage, with stored cold water (down service) being used solely for supplies to WCs, wash hand basins, etc. The supply shall not be softened. Additionally, it shall be established that the usage is sufficient to avoid deterioration in water quality, for example, that the inlet water temperature does not exceed 20°C and that the outlet does not remain unused.

The water supply to vending and ice making equipment shall be taken from a potable supply up stream of a regularly used outlet with the minimum of intervening pipe run i.e. less than 3 metres. The supply shall not be softened. Additionally, it shall be established that the usage is sufficient to avoid deterioration in water quality, for example, that the inlet water temperature does not exceed 20°C and that the outlet does not remain unused.

The equipment shall be positioned so that the warm air exhaust does not impinge directly on taps or hoses supplying cold water.

The domestic hot water system shall not be used for heating purposes and this includes all radiators, towel rails, heated bedpan racks etc, whatever the pipework configuration.

Central “common blending” systems shall not be used, since the length of distribution pipework containing water in the temperature range that supports bacterial growth and proliferation would far exceed the maximum permissible lengths mentioned above.

Water temperatures at all outlets, both Cold Water Services (CWS) and HWS, shall be measured at least once annually (where practicable) and a representative number ("direct" fed Sentinel taps) shall be measured at regular intervals. Temperatures shall be measured after two minutes for the CWS and one minute for the HWS at full flow and be maintained at <20°C and >50°C respectively.

Temperature monitoring shall be supported with regular microbiological sampling when considered necessary.

Scalding control in patient areas shall be achieved by the installation of Type 3 D 08 specification TMVs which shall be compliant with: a) The Health Guidance Note “Safe” hot water and surface Temperatures – 1998; and b) The National Health Service Model engineering specifications D 08 Thermostatic mixing valves (Healthcare Premises). The temperature from all such outlets shall be measured on a monthly basis and maintained at:

- 41°C for showers
- 41°C for basins
- 44°C for baths
- 37°C for bidets

Scalding control in non-patient areas shall be achieved by a combination of TMVs (where the risk of scalding has been assessed and considered to be high) and general “Warning! Hot Water” notices in public areas to indicate and warn users of the potential of scalding.

The pipe-work length from the TMV to the outlet shall be restricted to a maximum of two metres.

All TMVs shall be fitted with strainers, isolation valves and non-return valves.

All TMVs shall be accessible (as far as reasonably practicable).

All TMVs fitted to baths, bidets and showers shall be inspected and subjected to a fail-safe test on a six-monthly basis (carried out as described in the manufacturer’s instructions).

All TMVs fitted to facilities in “high risk patient areas” or “low risk patient area” shall be subjected to a periodical inspection and “as required” strip-down, cleaning and disinfection as indicated by the results of the inspection programme.

Designated drinking water systems and outlets water temperatures shall be measured at regular intervals. Temperatures must be aimed to be maintained within +/- 2°C from incoming mains water temperature. Where the water source is from a bore hole or where the temperatures recorded fall outside the recommended temperature limits, the monitoring must be supported with microbiological analysis for the presence of *E.coli* and presumptive coliforms.

Ward/Department management staff shall have the responsibility for identifying all infrequently used outlets within their area and subjecting these to a Daily flushing programme. The process shall be reported via the Trust’s Flushing Process using the current version of the Trust’s Flushing Sheet (See Appendix C, Section 22.4).

Where in-frequently used facilities are deemed by the ward/department staff to be no longer required, they shall be notified to the Estates Operations Team for removal. Removal will only be considered if supported by both departmental operational managers and Infection Prevention and Control.

Where a building or sections of the system remain unused for long periods of time, steps shall be taken as follows:

- Flush <u>all</u> water facilities (including toilet and urinal cisterns) thoroughly on a Daily basis whilst the building is not in use.

- If the facilities within a building are to remain unused for a prolonged period (more than one month), then the system shall be drained down, where practicable, (including all vessels) and cleaned and disinfected (any calorifiers are to be pasteurised) prior to being allowed back ‘on-line’. **Note:** The “Area Closure and Opening Process and Dead-leg Flushing pro-forma must be completed. Where this is not practicable, all associated facilities shall be flushed on a 3 x weekly basis.

- Consideration shall be given to isolating the unused sections from the system and possibly removing pipe-work and fixtures completely to avoid "dead-legs".

In addition to the flushing regime described above, careful consideration shall be given to the usage requirements of the system and any required system changes made accordingly. If it is deemed that the facilities are currently being used seasonally or remain unused for prolonged periods of time, then the following shall be considered:

- Re-engineer the system so that all CWS throughout the system are provided directly off the Mains Cold Water Supply (MCWS). This action will enable the isolation and removal of any cold water storage tanks.

- As part of the re-engineering of the CWS, it is also recommended that any water storage calorifiers are isolated and removed from the system and replaced with the required number of 'mains' fed instantaneous, point-of-use or multipoint water heaters.

- The absence of water storage vessels will reduce the inherent risk of storing stagnant water although it would not negate the need for flushing the remaining system.

Where a fire hose-reel is supplied by the domestic mains and the line supplying the hose-reels is quite exclusive, distinct and separate from the line supplying domestic facilities, the fire line shall be fitted with a suitable Reduced Pressure Zone (RPZ) valve. Where the fire and domestic supplies share the same line, each hose-reel spur shall be fitted with a double check valve. It is important, however, to ensure that the valves are fitted as close to the domestic line as possible in order to ensure that the dead-leg up-to the valves is kept as small as possible.

Although the removal of fire hose-reels and their replacement with local fire extinguishers is the ideal solution, this may not be readily practicable in some cases - where the above alternatives may be suitable.

Where the installation of RPZ or double check valves is not practicable, each unit shall be subjected to a Daily flushing regime in order to minimise stagnation and the potential for increased bacterial proliferation.

Regular checking of the hose-reels, for operational integrity, shall be maintained. This task, however, shall be carried out with due care and attention – ensuring that the creation of aerosols is as low as practicable.

The water in a self-contained eyewash station must be refilled, disposed, and maintained in accordance with manufacturer's instructions. Emergency showers shall also be flushed Daily to clean the line and verify proper operation.

2.6 Showers and Thermostatic Mixing Valves

All showers (shower-heads and associated hoses) shall be maintained in a good and clean condition and free from excessive scale and dirt deposition.

In all patient areas, all showers shall be fed via Type 3 D 08 specification Thermostatic Mixing Valves (TMV) which shall be maintained and operated at 41°C.

Central "common blending" shower-block systems shall not be used and all pipe-work length from the TMV to the shower-head shall be restricted to a maximum of two metres.

Where "common blending" shower-block systems are already in place, each system shall be fitted with a solenoid valve (at the furthest point from the mixer valve), programmed to automatically purge water for a three minute period each day.

All showers shall be subjected to regular temperature monitoring. The temperature monitoring shall be supported with regular microbiological sampling where considered necessary.

All shower-heads shall be inspected on a regular basis and de-scaled, cleaned and disinfected. The disinfection process shall include all associated hoses. See Section 7 for frequency.

Where biological results indicate significant local bacterial contamination and the contaminated outlet cannot be taken out of use for clinical reasons, the contaminated outlet shall be fitted with a suitable Point-of-Use filter to enable continued use of the facility. Where such filters are fitted, they shall be changed according to manufacturer's instructions.

2.7 Baths and TMV's

In all patient areas, all baths shall be fed via Type 3 D 08 specification TMVs which shall be maintained and operated at 44°C. Bath fill temperatures of more than 44°C shall 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 shall be devised to protect vulnerable patients.

All temperatures outside the recommended limits must be notified to the Estates Operations Team, as a fault, immediately.

Any injury to the patient during this procedure must be notified to the ward sister immediately using the appropriate incident report pro-forma's.

2.8 "Wet" Air Handling Units (Units Which Include Chilling and/or Humidification)

All "Wet" Air Handling Units (AHU) shall be maintained in a good and clean condition and free from excessive corrosion and dirt deposition.

All "Wet" AHU must be designed so that any water/condensate collected is discharged fully, freely and as quickly as possible. This can usually be achieved via a 1:20 fall being provided for runoff.

All associated drip-trays must be designed so that they can be easily accessible for cleaning and disinfection.

All associated drip-trays must be fitted with a suitable drain assembly which is fitted with a suitable glass trap and a Type A air-gap prior to connection onto central drainage systems.

All "Wet" AHU shall be subjected to a regular trap cleaning and disinfection.

All "Wet" AHU" shall be subjected to a regular internal components (drip-tray, chiller and heater batteries and humidifiers) cleaning and disinfection.

2.9 Ice Making Machines

The Estates Operations Team shall service each unit in accordance with manufacturers' instructions.

The "User" must carry out daily checks of the condition of the unit and records of the checks made shall be carried out by the person in charge of the area.

The "User" shall clean and disinfect the unit on a monthly basis or as recommended by the manufacturer, whichever is the most frequent.

All staff handling ice, those cleaning ice machines or equipment and any persons in charge of those staff shall be aware of these requirements. Training shall be provided to ensure all hazards and controls are understood. It shall include instruction on how to carry out cleaning, the use of cleaning equipment and a demonstration of how to handle ice without causing contamination.

Managers and staff carrying out checks need to be trained, in addition to that above, on how to carry out checks and how to record problems that arise and the action taken to deal with it.

Health and safety training shall also be included, for instance, the switching off of electrical power to machines before cleaning.

Ice is defined as food under the Food Safety Act 1990 and must be made, stored and handled so that it is not contaminated, a requirement of the Food Safety (General Food Hygiene) Regulations 1995.

The provision of suitable training is the responsibility of the department utilising the equipment.

Some micro-organisms are known to survive at low temperatures and surveys of ice used in drinks have shown high levels of bacteria present in up to 50% of samples. Some ice has even been found to contain various pathogenic bacteria, including *E. coli and Legionella pneumophila* and there can also be other contaminants. Ice can be contaminated by:

- Bacteria including pathogenic bacteria from the incoming water supply, people, raw foods and other objects that may come into contact with the ice such as contaminated scoops;
- Chemicals including misused cleaning and maintenance chemical;
- Physical contaminants including dust, dirt, etc.

In order to control the potential of microbiological and other contamination, the following actions shall be considered and implemented:

- Connect the machine directly to the mains water supply, not to a storage water tank, ensuring that the supply pipework is as short as possible and insulated from passive heat gain, particularly in locations where the supply pipework is directly next to the cooling fan. The use of Point-of-Use filtration maybe considered in locations of high concentration of immuno-compromised patients, following a Risk Assessment.
- Site the machine in a clean room, away from sources of contamination such as human waste (in sluice rooms) and cleaning chemicals.
- Use the ice machine in accordance with the manufacturers' instructions, as regards ambient temperatures, ventilation, water, electrical and drainage connections.
- Service the machine in accordance with the manufacturer's instructions, or at least twice a year. This is particularly essential in hard water areas where scale can build up and become a possible harbourage for micro-organisms.
- Clean and disinfect the machine in accordance with the manufacturer's instructions, usually at least once every two weeks. This shall include disposal of all ice in the machine. A suitable, non tainting disinfectant shall be used.
- Scoops, tongs or spoons used to remove ice to be washed and disinfected, (using a non tainting disinfectant), daily and kept in good order.
- Ensure the correct use of chemicals. The machine shall be cleaned with a non-abrasive cleaner, rinsed with fresh water, wiped around the inside with an anti-bacterial cleaner, (food use), rinsed again with fresh water and re-started. Note: The inner surfaces of ice making machines are particularly prone to the growth of moulds if not regularly cleaned.
- Wear clean clothing and ensure hands are clean before washing the ice machine.
- Wash hands before removing ice from the machine.
- Scoops shall not be left in the machine allowing the handle to come into contact with the ice.
- Store scoops in a clean place.
- Keep the lid closed.
- Never scoop ice by hand.
- Never store bottles or other foods in the ice machine.
- Do not use glasses as scoops as there is an obvious danger of contamination from glass fragments as glasses are easily broken.
- Ice containers must always be maintained in good order and provided with a lid.
- Ice containers shall be thoroughly cleaned after each use.
- Ice shall be thrown away once it starts to melt.

- Ice shall be removed using tongs or spoons that shall be cleaned and disinfected before use.
- Scoop etc. handles shall not be allowed to touch the ice in between use.
- Never use fingers to remove ice.
- Never refreeze melted ice.

2.10 Birthing Pools

Safety and hygiene are of paramount importance when using a Birthing Pool. There are four aspects to consider:

- Microbiological Safety
- Scalding Safety
- Electrical Safety
- Structural Safety

The bath must only be filled with water from the building's domestic water system and must be operated under the same management procedures outlined in Section 2.7 "Baths and TMV".

The source supply/(supplies) must be monitored on a monthly basis for the presence of microbiological growth including:

- *Pseudomonas spp.*
- *E.coli*
- *Legionella spp.*
- Total Viable Colony Count (TVCC)
- Algal growth.

If the supply(s) are found to be contaminated to an unacceptable level (to be determined by Infection Prevention and Control), the facility must not be used or the supply/(supplies) shall be fitted with suitable Point-of-Use filters to enable continued use of the facility. These filters must be replaced at a frequency recommended by the manufacturer.

Where the unit is supplied from dedicated local CWS and HWS, the unit, including any CWS storage vessels and heater units and hoses must be disinfected using a dilute solution of Chlorine dioxide (ClO_2). (50ppm for 1 hour) after each use. Where the supplies to the unit are from the main DWS of the building, surface cleaning using a suitable disinfectant shall suffice.

2.11 Hydrotherapy Pools

If they are not properly maintained, they can be a source of harmful micro organisms that can cause illness to users.

Bathers and the environment can pollute the water, which may lead to the spread of infectious diseases. Chemicals within poorly treated water can also cause problems such as skin rashes and irritated eyes.

Managers of pools are responsible for ensuring that the facilities they are providing are safe and hygienic.

Heated hydrotherapy pools can create a higher infection risk than cold pools if poorly maintained. The warm water provides an ideal environment for the rapid growth of many undesirable micro organisms since the disinfectants used can break-down more quickly at these higher temperatures.

Hydrotherapy pools have large volumes of people entering a small volume of water, therefore the organic and microbial loading may become high. This can have dramatic and harmful effects on

the water quality, therefore placing the health of the users at risk. In order to maintain the quality of the water, the following parameters must be measured on a Daily basis:

- Free Chlorine
- Total Chlorine
- Combined Chlorine
- Total Alkalinity
- Total Dissolved Solids
- pH

Measured parameters and associated limits:

Chlorine Disinfection						
Pool Temp	pH		Total Alk (Mg/L)		Unstabilised pool water (Mg/L)	
Ideal	Min	Max	Min	Max	Minimum free chlorine	Maximum total chlorine
28°C – 35°C	7.2	7.6	60	200	2.0	Free chlorine +1

For hydrotherapy pools with heavy bather loads it is recommended that approximately 25% of the pool water be replaced on a weekly basis.

It is recommended that hydrotherapy pool water is exchanged and passed through the filter at least once in every two hours. For heavily used hydrotherapy pools, such as those used for fitness exercising, the pool water turnover shall be less than one hour. The hydrotherapy pool must have a filtration system that provides a continuous circulation of the pool water through the filter.

Pool water characteristics: -

- High pH may cause the water to appear cloudy and scale formation. It may cause eye discomfort and dry skin to bathers.
- Low pH may cause chlorine to be rapidly lost from the water and the corrosion of metals. It may cause eye discomfort in bathers.
- Low alkalinity may cause a fluctuation in pH and also corrosion of metals.
- High alkalinity may cause a high pH, cloudy water and scale formation.
- Low temperatures may cause bathers to experience discomfort.
- High temperatures may cause an increase use of chlorine, bather discomfort, increased evaporation and increased scaling potential.

Water testing: -

- Pool water to be tested shall be taken from the pool outlet 300 mm below the water surface.
- Additional samples from around the inlet and from areas of high usage can provide valuable management information.
- Routine water testing shall be carried out three times a day, with the first test being carried out at the start of each day's operations.

2.12 Other Systems (Irrigation Systems, Lathes, Cutting Tools etc.)

All lathes and cutting tools shall be maintained in a good and clean condition and free from excessive corrosion and dirt deposition.

All lathes and cutting tools shall be flushed or emptied on a daily basis or used without coolant.

All lathes and cutting tools shall be subjected to a Monthly cleaning and disinfection.

Irrigation systems shall not use untreated water or untreated grey water and water shall not be dispersed using sprays.

2.13 Dental Chairs

The “user” shall ensure that all dental chairs have their reservoir (where applicable), emptied on a daily basis.

The “user” shall ensure that all dental chairs are cleaned and disinfected using appropriated disinfectant solutions as recommended by the manufacturer.

2.14 Portable Air Conditioning Units

The Estates Operations Team do not advocate the use of portable “wet” evaporative cooling point-of-use units within NUH. These units are considered to pose a significant risk of legionellosis because of their mode of operation, which includes the wetting of medium and the production of aerosols, which, if not maintained correctly, can increase the potential of bacterial growth and proliferation. The Estates Operations Team shall immediately isolate and remove any such units and advise the IPCT of the service receiver.

2.15 Humidified Incubators

All humidified incubators shall have their reservoir (where applicable), filled using only clinical sterile water.

All humidified incubators shall have their reservoir (where applicable), emptied on a daily basis.

All humidified incubators shall be cleaned and disinfected, after each use, using appropriated disinfectant solutions as recommended by the manufacturer.

2.16 Portable Humidifiers

Portable humidifiers shall not be used without the written permission of the ward/department manager who would need to ascertain suitability of use following an adequate risk assessment.

All portable humidifiers shall have their reservoir (where applicable), filled using only clinical sterile water.

All portable humidifiers shall have their reservoir (where applicable), emptied on a daily basis.

All humidified incubators shall be cleaned and disinfected, after each use, using appropriated disinfectant solutions as recommended by the manufacturer.

2.17 Evaporative Cooling Systems (Cooling Towers)

Cooling systems shall be designed and constructed so as to control the release of drift, to aid safe operation, cleaning and disinfection (see BS4485-3:1988 and BS4485-4:1996).

In particular, the following points must be considered:

Drift eliminators, usually made of plastic or metal, shall be installed in all towers. in spite of the name, the function of a drift eliminator is to ‘reduce’ rather than actually ‘eliminate’ aerosol drift. Although some types are more effective than others, there is no industry standard, however, they shall be well fitted and selected on the basis of their ability to reduce the release of small water

droplets - there shall be no visible drift released from the tower. Wooden slats do not control the small droplets and must be replaced. Operating conditions, especially the discharge air velocity, affect the efficiency of drift eliminators, for example, if the fan is not running. They are not always fitted on natural draught cooling towers because they may be ineffective.

The area above the cooling tower pond shall be as well enclosed as possible to reduce the effects of wind. wind movements around the tower may cause spray to escape through the sides, especially if it is poorly enclosed. This is particularly significant when the tower runs with its fan off as it may also be necessary to screen the tower or its pond to prevent the entry of birds, vermin, leaves or other debris or contaminants and to reduce solar heat gain.

The water distribution system within the cooling tower shall be designed to create as little aerosol (i.e. small water droplets) as possible. The water circuitry shall be as simple as is practicable, with the avoidance of dead legs and 'difficult to drain' loops and bends. Easily understood and accurate schematics of the various water circuits shall be available, with any dead legs or dead ends highlighted. Redundant pipework shall be removed. The absence of water circulation means that any microbial population can be left undisturbed for long periods, allowing growth and multiplication. Any subsequent disruption of the dead leg/dead end could lead to a rapid colonisation of the water system.

Those parts of the tower which become wet shall be accessible for cleaning; packs shall be readily removable and easily dismantled. The wetted areas of the tower shall, where possible, be shaded from direct sunlight to discourage the growth of algae. The pond shall have a sloping bottom with a drain connection at the lowest point which is large enough to carry away water and slurry quickly and easily. A suitably sized drain-down valve shall be located at the lowest point of the system so that it can be conveniently and completely drained, including all pipework and items of equipment. It may be necessary to fit supplementary drain valves to the bottom of individual items of equipment.

The tower shall be constructed of materials which can be readily disinfected and which do not support microbial growth. Preserved timber in accordance with BS5589:1989 may be used for the manufacture of cooling towers and packs but it needs to be impervious and easy to clean and disinfect.

Inclusion of a water meter in the tower supply pipeline both for the measurement of make-up rates and for the proportional dosage of treatment chemicals is recommended.

A full water treatment programme shall be integrated into the system design, with provision made for sample, injection, bleed and drain points and for the incorporation of dosing and bleed equipment; ideally this shall be automated.

Cooling towers shall be positioned as far away as possible from air-conditioning and ventilation inlets, opening windows and occupied areas, taking note of the prevailing wind direction and the wind distribution over neighbouring buildings. This shall also be considered when replacing old cooling towers as it may be possible to reposition them to a more suitable location.

2.18 Adiabatic Coolers

Adiabatic coolers shall be operated under a defined maintenance regime to ensure no water stagnation occurs. The Responsible Person (Water) shall ensure that all such systems are fully operable and maintained in accordance with the regulations and manufacturers' requirements.

When not in use, all water supplies to the units shall be flushed on at least a weekly basis.

Prior to the units being put back into use after a period of non-use, it shall be flushed for a minimum of 10 minutes and the sprays cleaned, de-scaled and disinfected, if practicable. this is in addition to the required flushing during the period of non-use.

2.19 Insulation

All pipework shall be insulated to the highest standard to give maximum energy efficiency.

Insulation on pipework and ductwork, if in view and less than 2m above a finished floor, shall have mechanical protection.

Insulation and protective coverings shall be protected against the mechanical damage where run/exposed on the surfaces in vulnerable areas e.g. an installation at low level in a corridor which may be subject to impact by cleaning machines, trolleys etc.

All insulation on pipework less than 2m above floor level in boiler houses and plantrooms shall have an aluminium protective sheet covering / finish to protect it from impact damage.

Surface-mounted pipework that is exposed at low level, that is, within 2m of the floor, presents an additional risk if it is carrying water above 43ºC and shall be securely insulated or "boxed" in. This includes vertical and horizontal pipe runs.

2.20 Externally Introduced Water Supplies

All tankers, bowsers and ground cleaning vehicles proposed for use on any part of the site as part of the project must be cleaned and disinfected prior to being used and disinfection certificates made available for inspection and filing.

Water used in tankers, bowsers and ground cleaning vehicles must be potable and from a suitable and identifiable supply.

Tankers, bowsers and ground cleaning vehicles must be maintained as clean as practicable and emptied when not used (more than one week).

When not in use, the bowser must be kept out of direct sunlight, particularly during the summer months, in order to ensure that the temperature of the stored water does not regularly exceed 20°C.

Furthermore, the bowser must be cleaned and disinfected on a monthly basis to BS6700:2006.

Fire fighting supplies shall not be used to provide water for any of the processes mentioned.

2.21 Installation and Commissioning

2.21.1 Introduction

While testing and commissioning is regarded as a discrete activity, continuous monitoring (using flushing sheets - see Appendix C, Section 19.4) is required throughout the installation to ensure that:

- 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;
- the work is done entirely within the specification for the scheme;
- 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.

2.21.2 Installation Checks

The system shall be regularly checked during installation 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 shall 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.

2.21.3 Inspection of Joints

Before pressure testing, the site engineer shall 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 vary according to the size of the installation, but as a guide, a ratio of one fitting per 400 installations shall be cut out. In any event, a minimum of two, and not normally more than five, fittings shall be cut out for examination. The fittings cut out shall be cut open (quartered longitudinally) and examined.

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

2.21.4 Commissioning

Correct commissioning is vitally important for the satisfactory operation of the hot and cold water systems. The designer shall prepare a commissioning brief for use by the contractor's commissioning engineer. This brief shall specify fully and clearly the extent of the commissioning and the objectives which must be achieved, and shall include: -

- full design data on temperatures, water flow rates and pressures;
- plant and equipment data;
- number commissioning procedures for thermostatic mixing valves in accordance with specification MES D08;
- drawings and schematics;
- a list of test certificates to be provided.

The designer's attention is drawn to CIBSE Commissioning Code W: 'Water Distribution Systems 2010', which provides guidance on information that will be required by the commissioning engineers. In the preparation of commissioning instructions for domestic hot and cold water services, designers shall ensure that their work is in accordance with up-to-date guidance from the DoH.

The designer shall prepare for inclusion in the contract documents a list of tests and measurements that are to be taken by the contractor and recorded by him/her. These shall be witnessed by the contract supervising officer or project manager on his/her behalf and he/she, if approved, will circulate the results, in accordance with the client's instructions.

The installation, on completion, shall be operated by the contractor as a whole, and subjected to functional or performance tests as specified by the designer. The commissioning manual shall be prepared by the contractor and submitted to the client's commissioning adviser for review before being issued in final form. Typical schedules of checks and performance tests shall be included in the commissioning manual together with record sheets. These shall be amended and supplemented as the designer considers necessary. Once the client's commissioning adviser is satisfied that the system meets the design intent, the final accordance record sheets shall be completed.

If performance is not acceptable, the matter shall be dealt with in accordance with the contract requirements. The project manager, who shall countersign any relevant test record documents, shall witness commissioning and testing. "As installed" record drawings, schematic diagrams, operating and maintenance instructions must be supplied at the time of handover. Certified records of pressure testing and disinfection shall also be made available.

The whole commissioning procedure shall be carried out under the guidance of a single authority, although the involvement of specialists or manufacturers may be required for specific items of plant. Valid calibration certificates shall be submitted and checked for all measuring equipment to be used by the commissioning engineers prior to commencement of commissioning. The commissioning shall be carried out in a logical and methodical manner.

The installation, on completion, shall be operated by the contractor as a whole, and subjected to specified functional or performance tests. Once the system meets the design intent, the final completion record sheet(s) shall be completed. In the event of performance not being acceptable, the matter shall be dealt with in accordance with the contract requirements.

Further details can be found in Section A37 of the NUH's Operation/Maintenance of the Finished Building Section within Capital Contracts.

2.21.5 Commissioning and Testing Checklist

The following is a summary of the key activities associated with pre-commissioning and commissioning of hot and cold water storage and distribution systems. The list is not intended to be comprehensive.

2.21.6 Cold Water Installations

Pre-commissioning checks can be carried out on completion of the system installation, filling and pressure testing. Pre-commissioning checks and tests to be applied are as follows. Check that:

- have been provided and installed in accordance with specification and drawings, and that the systems are charged with water, vented and free from leaks;
- 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;
- distribution pipework is rigidly supported, insulated, and incorporates adequate provisions for venting, draining, expansion, isolation and measurement of flow, temperature and pressure;
- pipework systems have been pressure tested;
- pipework systems and storage cisterns have been flushed, disinfected, appropriate certification received, and that specified residual chlorine levels are attained;
- pipework systems and storage/break tanks are correctly identified and marked;
- regulating valves and flow control devices operate freely;
- water meter(s) is/are fitted correctly;
- electrical isolation, cross-bonding and wiring of system components are installed in accordance with the current edition of BS7671:2008.

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:

- 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;
- float-operated valves function satisfactorily and are adjusted to give the correct water level;
- control valves operate correctly and shut-off valves close tightly;
- all electrical circuits are tested and the pump motor direction of rotation is correct, and that electrical controls and alarms function correctly;
- operation of any safety or anti-flood device is satisfactory;
- circulating or lifting pumps are free from excessive noise, vibration and leaks;
- remote control of pumps (if appropriate) is satisfactory;
- the installation is vented and regulated;
- the flow rate into, and out of, storage cisterns is recorded;
- 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);
- temperature of water in storage cisterns and at taps is appropriate;
- full load current of components does not exceed the recommended values;
- the running current of components does not exceed the recommended values;
- pump thermal overload trips are set;

- system schematic is displayed in a frame in the relevant plantroom, complete with valve schedule.

2.21.7 Hot Water Installations

Pre-commissioning checks can be carried out upon completion of system installation, filling and pressure testing. Pre-commissioning checks and tests to be applied are as follows. Check that:

- systems have been provided and installed in accordance with the specification and drawings;
- the system is charged with cold water, vented, and free from leaks;
- hot water storage vessels are free from leaks and are properly supported and secured;
- distribution pipework is rigidly supported, insulated, and incorporates adequate provision for venting, drainage, expansion, isolation, and measurement of flow, temperature and pressure;
- pipework systems, storage cylinders etc have been pressure tested, flushed and disinfected, and appropriate certification has been received, and that specified residual chlorine levels are attained;
- pipework systems, calorifiers and cisterns are correctly identified and marked;
- regulating valves and flow control devices operate freely;
- all control and regulating valves are labelled or marked to correspond with reference numbers on contract drawings;
- electrical isolation, cross-bonding and wiring of system components is installed in accordance with the current edition of BS 7671:2008;
- 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. Check that:

- 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;
- all temperature and other controls are adjusted and calibrated to agreed design limits of system performance;
- all electrical circuits are tested and the pump motor direction of rotation is correct, and that electrical controls and alarms function correctly;
- control valves operate correctly and shut-off valves close tightly;
- heat exchangers operate satisfactorily;
- primary heating circuits are adjusted and regulated, and thermostatic settings are correct; and that bypass circuits and automatic control valves operate correctly;
- circulating pumps are free from excessive noise, vibration and leaks;
- remote and automatic control of pumps (if appropriate) is satisfactory, and there are no leaks at joints under maximum flow conditions;
- secondary circuits are regulated and vented;
- thermostatic mixing devices and regulating valves are adjusted and set to desired values (TMVs require hot and cold water for testing and commissioning, and shall be commissioned in accordance with MES D08);
- all taps, mixers and outlets operate satisfactorily;
- water flow quantities at all plant items, regulating valves and flow-measuring valves are recorded;
- mass flow from taps, main and other outlets in positions shown on contract drawings is satisfactory;
- pressure drop at heat exchangers at full design demand flow is tested and recorded;
- hydraulic balancing of hot water secondary circulation system is carried out to ensure that minimum temperatures are achieved in all parts of the circuit;
- full load current of components does not exceed the recommended values;
- the running current of components does not exceed the recommended values;
- pump thermal overload trips are set.

2.21.8 Pressure Testing

Pressure testing must be carried out before disinfection. Except where otherwise specified, testing of underground pipelines shall be carried out in accordance with the requirements of the Water Supply (Water Fittings) Regulations 1999. Open pipes shall be capped and valves closed to avoid contamination.

2.21.9 Temperature Testing

These tests shall be performed prior to contractual handover and bringing the system into use. Separate thermostatic measuring and recording equipment shall 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 shall include:

- measuring the incoming water temperature at the main water meter;
- testing the inlet, outlet and surface water temperatures of cisterns and cold water feed/header tanks for the hot water calorifiers. The temperature shall not be greater than 2°C above that measured at the incoming water temperature;
- testing the flow and return temperatures at connections to calorifiers and water heaters. These shall not be less than 60°C and 50°C respectively;
- 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;
- 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 55°C is achieved within 1 min;
- testing single cold water outlets and inlets to mixing valves to ensure that temperature equilibrium below 20°C is achieved within 2 min.

Note 1:
L8 permits a period of 1 minute to achieve an equilibrium temperature of 50°C. 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 shall 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.

Note 2:
L8 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 50 m dead-leg of 15 mm pipe or that stagnation is occurring.

In addition, Operating and maintenance manuals shall be provided for all building services installation. These shall include all relevant sections as described in BS6700:2006 and particularly HTM 04-01.

2.21.10 General

It is essential that a full report of all commissioning and testing activities is compiled and handed over to be incorporated within the operation and maintenance manuals. These commissioning and testing records will be required so that subsequent maintenance and periodic checks can be made to ensure that the installation continues to operate as intended.

Such information will include results of temperature checks on the cold water supply, hot water circulating systems and trace-heated hot water installations, and commissioning and in-service test data for Type 3 TMVs. The information shall also include identification of, and test results for,

sentinel taps. Where continuous water treatment is installed, the commissioning records shall include details of settings of the equipment, dosing rates and requirements for testing.

Operation and maintenance manuals shall be in accordance with BSRIA's (1990) Application Guide 1/87: 'Operation and maintenance manuals for building services installations'.

As a minimum, for new installations or major refurbishment, the contract shall require the following documents and drawings to be supplied:

- review and updating of the Trusts Legionella Risk Assessment;
- full manufacturing details, including batch numbers of all pipes and fittings;
- full records and certificates of pressure tests for all sections of pipework;
- settings of all balancing valves, with readings of flow rates where applicable;
- full details of each item of plant, including arrangement drawings and appropriate test certificates;
- as-fitted drawings showing clearly the location of balancing valves, flows and settings, isolation valves, drain valves;
- schematic drawings for installation in plantrooms showing all valves and items of plant;
- full details of water treatment parameters and operating modes and settings;
- full details of maintenance requirements;
- detailed confirmation of disinfection procedures to BS 6700:2006, and results of post-disinfection microbiological analysis;
- full records confirming that all materials and fittings hold WRAS or equivalent accreditation.

3 RISK ASSESMENTS

A suitable and sufficient Legionella risk assessment shall be carried out on all buildings in accordance with BS8580:2010 – Water Quality – Risk assessments for Legionella Control – Code of Practice. These will be reviewed at least every two years in order to identify and assess the risk of Legionellosis and water quality issues from work activities and water sources on the premises and organise any necessary precautionary measures.

The assessments will be reviewed annually and updated when there are significant changes to statutory standards, operational requirements and when there are significant changes to a building's domestic water and for wet air systems.

Systems which are susceptible to colonisation by legionella, and which incorporate means for creating and disseminating water droplets, will be identified, and the risk they present will be assessed. Risks will be assessed not just for the routine operation of the system, but also in unusual circumstances such as; breakdown, abnormal operation, design, installation and commissioning. Action plans and work procedures shall be developed and implemented to reduce the risk to a minimum.

The objective of the risk assessment is to institute management procedures to ensure that compliance is continuing and not notional.

The primary purpose of the assessment is to demonstrate that management has identified all the relevant factors, has instituted corrective or preventive action, and is monitoring that the plans are implemented and effective.

A further purpose of the assessment is to enable a valid decision to be made about: -

- the risk to health, i.e. whether the potential for harm to health from exposure is reasonably foreseeable unless adequate precautionary measures are taken;
- what control measures are to be implemented to the minimise the risk from exposure to Legionella.

The assessment will include identification and evaluation of potential sources of risk and: -

- the particular means by which exposure to Legionella is to be prevented; or
- if prevention is not reasonably practicable, the particular means by which the risk from exposure to Legionella is to be minimised.

The assessments, action logs, written schemes and implementation of precautionary measures, will be carried out by members of the Estates Operations Team who have had and can demonstrate suitable and appropriate training or shall be commissioned from a suitably qualified and experienced third party.

Where additional resources and guidance are required this will be by the appointment of one or more experts from outside the Trust with clear, written responsibilities and lines of communication.

Where the assessment demonstrates that there is no reasonably foreseeable risk or that risks are insignificant and unlikely to increase, no further assessment or measures are necessary. However, shall the situation change, the assessment shall be reviewed and any necessary changes implemented.

The assessment will be reviewed at least annually or whenever there is reason to believe that the original assessment may no longer be valid or in accordance with the schedule detailed above. This may be because of: -

- changes to the plant or water or its use;
- changes to the use of the building in which it is installed;
- the availability of new information about risks or control measures;
- the results of checks indicating that the control measures are no longer effective.

In identifying and assessing the risks in any water system, and in drawing up and applying the necessary control measures, notice shall be taken of the Health & Safety Executive (HSE) Guidance Notes, appropriate Health Technical Memoranda (HTM) and British Standards described in the Policy Document.

A written operational plan will be devised based on the results of the Risk Assessments and following discussions with the Infection Prevention and Control Team. This will clearly identify who has overall accountability for the premises, and who is responsible for devising and carrying out the procedures.

Inadequate management, lack of training and poor communication have all been identified as contributory factors in outbreaks of Legionnaires' disease. It is therefore important that those people involved in assessing risk and applying precautions are competent, trained and aware of their responsibilities.

The Appointed Persons responsible for overseeing the assessment and implementation of precautions will ensure that effective measures are carried out in a timely manner.

The aim of the risk assessment must be to outline and to place on record, a descriptive plan of the extent, condition and design of the domestic water and air handling systems within the building surveyed, and to assess the risk of bacterial contamination posed by these systems, particularly from Legionella bacteria.

Legionellosis management and control risk assessments are a **statutory requirement** under current guidelines and legislation, they shall be carried out as part of the total *"Management Systems Controls"* package for the Trust and shall not be carried out *"just to comply".*

A risk assessment shall be carried out in order to allow the Appointed Persons to qualify or instigate any remedial or on-going works and in order to furnish the Appointed Persons with the necessary system information for setting-up and implementing action plans.

The relevant authorities recommend that the risk assessment shall be carried out by independent bodies and shall not take the form of a quotation for any remedial works required. The risk assessment shall not only concentrate on the physical condition of the associated plant and equipment, the *"hardware",* but must also assess the risk posed by the management and execution of the controls systems, *"software",* in place.

All recommendations made in the risk assessment, must be made with the specific requirements of the Trust and must take into consideration manpower and budgeting considerations.

The risk assessment shall include risk analysis on the following areas of the systems:

3.1 Cold Water Services - Storage

- Physical condition and hygiene standard of all associated Water Storage Tanks.
- Design and configuration of all associated Water Storage Tanks.
- Capacity requirements and available storage capacities of all associated Water Storage Tanks.
- Temperature profiles of all associated Water Storage Tanks.
- Biological activities of all associated Water Storage Tanks.
- Water Supply Regulations parameter compliance of all associated Water Storage Tanks, including location and accessibility.

3.2 Cold Water Services - Distribution

- Physical condition of all associated distribution pipe-work.
- Design and configuration of all associated distribution pipe-work.
- Temperature profiles of all associated distribution services and outlets.
- Biological activities of all associated distribution services.

- Presence of dead-legs and areas of low-flow within all the associated distribution services.
- Usage considerations of all associated distribution services.

3.3 Hot Water Services - Hot Water Generation and Storage

- Physical condition of all associated Hot Water Generating Units.
- Design and configuration of all associated Hot Water Generating Units
- Temperature profiles of all associated Hot Water Generating Units, to include; flow, return and drain temperatures.
- Capacity requirements and available storage capacities of all associated Hot Water Generating Units.
- Presence of temperature stratification within associated Water Storage Calorifiers.
- Biological activities of all associated distribution services.

3.4 Hot Water Services - Distribution

- Physical condition of all associated distribution pipe-work.
- Design, configuration and accessibility of all associated distribution pipe-work.
- Temperature profiles of all associated distribution services and outlets.
- Biological activities of all associated distribution services.
- Presence of dead-legs and areas of low-flow within all the associated distribution services.
- Usage considerations of all associated distribution services.
- Presence of space-heating within all associated distribution pipe-work.
- Condition, temperature profiles and operation status of all showerheads within all associated distribution services.
- Condition, temperature profiles, accessibility and operation status of all Thermostatic Mixing Valves within all associated distribution services.
- Presence of undesired lengths of blended water pipe-work within all associated distribution services.

3.5 Air Conditioning

- Physical condition of all associated Air Handling Units.
- Design, configuration and accessibility of all associated Air Handling Units.
- Method of humidification and operation status of all humidifiers within all associated Air Handling Units.
- Condition, design and configuration of drip-trays within all associated Air Handling Units.
- Condition, design and configuration of glass traps/U-bends within all associated Air Handling Units.
- Physical condition and hygiene standards of duct-work of all associated Air Handling Units.

3.6 Nebulisers - Maintained by Medical Physics

- Type of units in use: disposable or otherwise.
- Physical condition of units.
- Water sources used.
- Usage profiles.
- Maintenance Programme and Hygiene Standards employed.

3.7 Dental Chairs

- Type of units in use.
- Physical condition of units.
- Water sources used.
- Usage profiles.
- Maintenance Programme and Hygiene Standards employed.

3.8 Humidified Incubators

- Type of units in use.
- Physical condition of units.
- Water sources used.
- Usage profiles.
- Maintenance Programme and Hygiene Standards employed.

3.9 Portable Humidifiers

- Type of units in use.
- Physical condition of units.
- Water sources used.
- Usage profiles.
- Maintenance Programme and Hygiene Standards employed.

3.10 Evaporative Cooling Systems (Cooling Towers)

- Location and physical condition of Cooling Towers and associated distribution pipe-work.
- Design, configuration and accessibility of Cooling Towers and associated distribution pipe-work.
- Type and condition of drift eliminators.
- Type and condition of pack.
- Status and condition of all associated stand-by equipment such as pumps etc.
- Levels of corrosion, sludge deposition, scale and biological activity.
- Status and efficacy of Water Treatment regimes.
- Status and efficacy of Biological Control Treatment regimes.

3.11 Other Systems

- Type of unit.
- Potential to cause an aerosol.
- Potential of aerosol being inhaled.
- Physical condition units and associated plant.
- Location, design, configuration and accessibility of all units.
- Water Treatment Programmes in place and their efficacy (if applicable).
- Maintenance Programme and Hygiene Standards employed.

3.12 Management, Maintenance and Record Keeping

- Presence of and adequacy of all implemented Monitoring and Maintenance Programmes in place.
- Presence of and adequacy of all implemented Record Keeping Programmes in place.
- Presence of and adequacy of all implemented Auditing Programmes in place.

All areas listed above must be measured and expressed numerically indicating the contribution of each area to the overall risk.

3.13 Current Risk Assessment Status

A full list of all current risk assessments is available for inspection upon request from the Responsible Person Water or his Deputy Responsible Person.

3.14 Updating of the Risk Assessment(s) - Alterations

Reviewing and updating of the Risk Assessment shall occur when any minor or major capital or maintenance project have taken place which has meant a change in the fabric or the use of water systems.

4 PREPARATION OF ACTION PLAN

On completion of the Risk Assessments the Responsible Person Water shall undertake the following procedure:

- Develop schemes for risk minimisation and control in order of priority giving consideration to cost, risk and difficulty.
- List all buildings in priority order of non-compliance and potential risk.
- Devise a management programme for the minimisation of risks so that an action plan identifying resources and timescales is drawn up.
- Manage the programme and identify compliance failures for remedial action.
- Review the programme of the action plan at 6-Monthly intervals and record progress in implementing the work. All changes to the water systems and functional content shall be recorded and evaluated.

5 MAINTENANCE AND CARE OF WATER SYSTEMS EQUIPMENT

The plant and equipment used in the Trust's buildings which have water in the system and can affect the water supply or the atmosphere shall be monitored regularly and be subjected to the following regime:

- The systems shall be carefully designed so as to minimise aerosols and the material used in construction would not harbour or provide nutrient for bacteria. They shall be designed to be readily drained and cleaned.
- The systems shall be maintained in a clean and sound condition and must be easily and safely accessible.
- All plant and distribution pipe-work (where accessible) shall be clearly labelled.
- The water quality shall be maintained by ensuring the systems are kept in a good condition by regular cleaning and disinfecting by a regular dosage of water treatment.
- Careful monitoring of the precautions.
- Records must be kept of the maintenance performed and the results obtained.

5.1 Risk Management Processes and Procedures

In order to ensure that the devised Risk Management Programme is effective in minimising or controlling the risk of Legionellosis, the Trust (or others on its behalf) shall undertake a number of

risk management processes including the periodic inspection and monitoring of plant, systems and equipment. These processes shall include:

- Non PPM Programme Control Processes which shall be used when and 'As Required' – See Section 6 NON PPM PROGRAMME CONTROL PROCESSES.

- PPM Programme scheduled tasks to be carried out systematically – See Section 7 PRE-PLANNED MAINTENANCE PROGRAMME - TASK FREQUENCIES

5.2 Calibration

Temperature measurement equipment and water sampling equipment used by the Estates Operations Team or by contractors carrying out monitoring works on behalf of the Estates and Facilities Department shall be calibrated on an annual basis and the certification of calibration appropriately provided and held by the Nominated Responsible Person. Calibration service providers shall be accredited via UKAS calibration and accredited to ISO/IEC17025:2005. Records of calibration will be compiled and held on file to enable reference to be made as and when required.

Any temperature measurement equipment used by Ward staff shall be capable of being adequately calibrated, as described above, and held by the Ward Manager.

6 NON PPM PROGRAMME CONTROL PROCESSES

6.1 Dead Legs/Areas of Low-Flow Usage Evaluation and Flushing

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	1	Advice Note:	N/A
Task:	Dead Legs/Areas of Flow Usage Evaluation & Flushing		
Frequency & Audience:	**DAILY BY WARDS (USING FLUSHING SHEET APPENDIX C, 22.4 AND EFM WEBSITE)**		

Systems or individual outlets that are not frequently used allow the development of stagnant water conditions, which increase the potential of bacterial growth and proliferation, including Legionella. In order to remove any stagnation that may have developed or to stop stagnation from occurring in the first place, it is important to introduce a "flushing" programme where necessary. The Director of Nursing or Clinical Leads/Departmental Heads shall have the responsibility to ensure that this requirement is implemented and systematically audited to ensure adequate and correct implementation.

The flushing programme must be designed so that it allows for the whole dead-leg to be removed. This is achieved by ensuring that the flushing is carried out at the specified system or outlet and for an appropriate length of time. The length of time of purging water from the system is important because it is vital to ensure that all the stagnant water has been expelled from the pipe-work and at least until "circulating" or "fresh" water is drawn from the outlet (water at temperatures exhibited throughout the rest of the system).

The flushing programme shall follow the procedure outlined below: -

- All areas are to be flushed daily and recorded (See Appendix C Section 22.4).
- Ensure that the system/outlet can be flushed safely and in a tidy manner into an appropriate drain if not plumbed for drainage.
- Ensure that the purging of water from outlets does not create an unnecessary amount of aerosol at least no more than would be created when outlet is operated normally.
- Ensure that "splash-back" is minimised, where practicable, by placing a sponge or another material capable of absorbing some of the force of the water against the surface of the appliance.
- Purge the hot and the cold or the mixed water in turn for a minimum of 2 minutes or for a period of time necessary to draw water from the outlet at temperatures exhibited throughout the rest of the system.
- If a system or an area consisting of multiple outlets requires flushing, it is important to begin with the nearest outlet to the main distribution pipe-work, working progressively away from the main distribution pipe-work.
- Where showers need to be flushed, it is important to ensure that, where practicable, the shower-head is removed in order to reduce the potential of aerosol production. Where the head is fixed, exposure to the aerosol produced must be minimised. One method that can be employed in this situation is the use of a transparent plastic bag, fixed around the shower- head, with one corner pierced to allow partial discharge of water.
- Consider whether the system/outlet can be removed negating further flushing.
- Report the process via the Trust's Log-book system and EFM Website
- The flushing sheets are to be retained on the ward for their own records and a copy sent to the Estates & Facilities Department on a weekly basis
- Clinical Leads will then report to the Infection Control Operational Group on the compliance with this control process

6.2 Notification of Closure or Section / Area Process Specification and Pro-Forma

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	2	Advice Note:	N/A
Task:	Notification of Closure of Section / Area		
Frequency & Audience:	**CAPITAL PROJECTS & MAINTENANCE**		

When major changes to the domestic water are planned as part of system modifications, alterations and/or refurbishments, the Capital Team (Projects) shall ensure that the site installation and commissioning procedures are addressed. These shall include all relevant sections as described in BS6700:2006 and particularly HTM 04-01 Sections 16 and 18.

During the temporary closure of areas, where no major modifications, alterations and/or refurbishments are planned, a procedure for flushing hot and cold water systems shall be instituted. This shall include for opening all taps and WC cisterns etc for a period of 2 minutes daily. Alternatively when this is impractical, the system can be disconnected and the procedure recommended for new installations (BS6700:2006 clause 6.1.10.4) may be carried out immediately prior to reoccupation (Project Manager/Supervising Officer (SO) responsibility). All area closures and planned re-opening dates if known shall be notified to the site Responsible Person Water and Infection Prevention and Control Officer by the Departmental Manager or Project Manager.

Note: It is the responsibility of the Responsible Person Water to ensure the actions are taken and a completed copy of this form is sent to IPCT and Ward/Area Manager and a copy retained within Estates Operations (Note: It is the Project Manager/SO responsibility to provide and demonstrate to the Responsible Person all actions required).

Note: "Section/Area" refers to; a ward, part of a ward, a room within a ward, a section of a building etc.

Section proposed closure:				
Is all of the Section proposed for closure?	Yes		No	
If No, specify:				
Date for proposed closure:				
Period of proposed closure:				
Reason for proposed closure:				
Are major modifications, alterations and/or refurbishments planned?	Yes		No	
If Yes, Project Manager/SO:				

Notification of closure of section/area page 1 of 2

Will the use of the Section change following re-opening:	Yes		No	

If Yes, specify:	
Project Manager/occupier:	
Date:	Signature:

This section to be completed by the Responsible Person Water

Form received by:	
Date:	

Does this Section need to be included in a “Flushing” Programme?	Yes		No	
If Yes, has Section been included in “Flushing” Programme?	Yes		No	

If Yes, start date:	
Person/Organisation responsible for flushing:	
Signature of Person/Organisation representative:	
Responsible Person Water:	
Date:	Signature:

Notification of closure of section/area page 2 of 2

6.3 Handover Protocol for New Build and Refurbishments and Permit to Open Section / Area Process Specification and Pro-Forma

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	3	Advice Note:	N/A
Task:	Handover protocol for new build and refurbishments and permit to open section / area		
Frequency & Audience:	**3 DAYS PRIOR TO SECTION AREA RE-OPENING - CAPITAL PROJECTS & MAINTENANCE**		

Where applicable, chlorination certificate and flushing records received from installer (Project Manager/SO responsibility) and a copy provided to the Responsible Person Water.

Water temperatures to be recorded 3 times equally spaced over 24 hours (Project Manager/SO to all outlets with responsibility to demonstrate to Responsible Person Water or designated representative). After 1 minute of running hot water the minimum temperature to be reached shall be minimum 50°C.

Failure to achieve 50°C return temperature shall be reported to the Responsible Person Water and Infection Prevention and Control Officer (Project Manager/SO responsibility).

Cold water temperature recorded shall be <20°C (Project Manager/SO responsibility to demonstrate to Responsible Person Water or designated representative).

Failure to achieve items to be discussed with Infection Prevention and Control Officer and Responsible Person Water.

Shower heads shall be cleaned and disinfected (Project Manager/SO responsibility to demonstrate to Responsible Person Water or designated representative).

Blender valves shall be cleaned and disinfected (Project Manager/SO responsibility to demonstrate to Responsible Person Water or designated representative).

Water samples shall have been taken for microbiological analysis (TVCC *E.coli, Pseudomonas spp.*). Samples must not be taken within 48hrs from the last disinfection process. It is the responsibility of the Project Manager/SO to hand over copies to the Responsible. Person Water. Note: Results of these must be received before opening the ward/area and discussed with the Consultant Microbiologist.

Water samples shall have been taken for microbiological analysis (*Legionella spp.*). It is the responsibility of the Project Manager/SO to hand over copies to the Responsible Person Water.

Handover protocol for new build and refurbishments
and permit to open section / area page 1 of 2

At Hand-over				
No.	Description	Yes	No	N/A
1.	Is the Section/Area complete?			
2.	Is the domestic water installation complete?			
3.	Is HVAC installation complete?			
4.	Have all the commissioning data in accordance with BS6700:2006 and HTM 04-01 Sections 16 and 18 been received?			
5.	Have all material and fittings WRAS certificates been received?			
6.	Has the installation been surveyed and Risk Assessed?			
7.	If Yes, have any faults/short-falls been identified?			
8.	If Yes, have all these faults been rectified?			
9.	Has the system been disinfected in accordance with BS6700:2006 clause 6.1.10.4?			
10.	If Yes, When? Date:			
11.	If Yes, have the disinfection certificates been received?			
12.	Have bacteriological samples been taken following disinfection?			
13.	If Yes, any positive results obtained?			
14.	If Yes, please provide sample results?			
16.	Has the system been flushed Daily since disinfection?			
17.	If Yes, have flushing records been received?			
18.	Are there any flexible hoses fitted?			
19.	Is the installation of flexible hoses acceptable?			
20.	Have all whb's, bidets, showers and baths had their temperatures taken (Process Sheet 6)			

All actions have been undertaken and Section/Area permitted to re-open:

Responsible Person Water:			
Date:		Signature:	

Infection Prevention and Control Officer :			
Date:		Signature:	

Scheme Project Manager / SO			
Date:		Signature:	

Handover protocol for new build and refurbishments
and permit to open section / area page 2 of 2

6.4 New Pipework and Associated Components Pre and Post Installation Cleaning and Disinfection Process Specification and Pro-Forma

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	4	Advice Note:	N/A
Task:	New pipework and associated components pre and post installation cleaning and disinfection process		
Frequency & Audience:	**3 DAYS PRIOR TO SECTION AREA RE-OPENING - CAPITAL PROJECTS & MAINTENANCE**		

If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.

Small Sections - new pipework (less than 2 metres) and associated components pre-installation cleaning and disinfection

- Thoroughly clean all new pipework to be installed.
- Using a suitable vessel, safely prepare a disinfectant solution of sodium hypochlorite of 100mg/l (ppm) free chlorine.
- Safely immerse all cleaned pipework and associated components in the disinfectant solution and leave to soak for a minimum of 30 minutes.
- Remove pipework and associated components from disinfectant solution and rinse with fresh clean water for a minute and allow them to drip dry in a clean, cool dry place and install within 12 hours of disinfection.

Medium Sections - new pipework (more than 2 metres) and associated components pre-installation cleaning and disinfection

NOTE: All components must be cleaned and disinfected as described above, prior to installation.

- Ensure than new pipework is isolated from existing pipework with isolation valves and fitted with injection points at either end. Isolation valves must be locked-off until such time that the microbiological results indicate that the system is safe to use.
- Using a suitable vessel, safely prepare a disinfectant solution of sodium hypochlorite of 50mg/l (ppm) free chlorine.
- Using a suitable pump, inject disinfectant solution in the new pipework and allow to circulate for at least 1 hour. Measure level of free chlorine after 1 hour and ensure that it is at least 30 mg/l (ppm). If disinfectant level is below 30 mg/l (ppm) after 1 hour, repeat this step.
- Thoroughly flush the new pipework with clean mains water until tests indicate that the residual level of free chlorine is no greater than 0.5 mg/l (ppm), or that present in the mains water supply.
- Using a suitable sterile containers, collect water samples and submit for biological analysis. The analysis shall measure the presence of contamination by general bacteria (TVCC).
- **NOTE: Samples to be collected <u>no earlier than 48 hours</u> following disinfection.**

New pipework and associated components pre and post installation
cleaning and disinfection process specification and pro-forma page 1 of 2

Large Sections - new pipework (large sections of pipework and new complete installations) and associated components post-installation cleaning and disinfection

NOTE: All components must be cleaned and disinfected as described above, prior to installation.

- If CWS storage vessels are associated with the system, they shall be cleaned and disinfected before the new pipework is disinfected.
- Any water treatment equipment shall be disconnected from the system. The pH of the water shall be measured and must be between 5.5 and 9.0 before chlorinating solution is introduced. If pH is found to be below 5.5 the system shall be drained, flushed and refilled with fresh water.
- Treated water must then be used to charge the distribution system. If a storage vessel is associated with the system, the disinfectant solution must be prepared in and supplied by this vessel. If a storage vessel is not associated with the system, a portable vessel must be used to deliver the disinfectant solution as described above.
- Sampling points representative of the system must be tested to ensure 50 mg/l (ppm) free chlorine throughout the system to start disinfection. The whole system must be allowed to stand charged for a minimum period of 1 hour, a representative number of samples must be taken from the distribution system and tested to ensure levels have been maintained above 30 mg/l (ppm) free chlorine. All test and sampling points must be identified and the results of each test recorded.
- The system shall be thoroughly flushed out with clean mains water until tests indicate that the residual level of free chlorine is no greater than 0.5 mg/l (ppm), or that present in the mains water supply.
- Using a suitable sterile containers, collect water samples and submit for biological analysis. The analysis shall measure the presence of contamination by general bacteria (Total Viable Colony Count – TVCC).
- **NOTE: Samples to be collected <u>no earlier than 48 hours</u> following disinfection.**

Neutralisation:

Disinfectant solutions of more than 3000 litres must be neutralised before disposal with sodium bisulphite (SB) or sodium thiosulphate (ST) at the rate of 350 gm SB/m^3 or 525 gm ST/m^3 of disinfectant solution.

NOTE: Ensure that for installations of large section of pipework and new complete installations the 'HAND-OVER PROTOCOL FOR NEW BUILD AND REFURBISHMENTS'; 'PERMIT TO OPEN WARD/AREA' and 'TEMPERATURE CHECKS TO BE UNDERTAKEN WHEN' protocols are completed before putting system into use. These records and associated certificates must be issued with 'hand-over documentation' and maintained in the 'Site Log Book System'.

6.5 Point of Use Filter Installation and Replacement

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process Nº:	5	Advice Note:	N/A
Task:	Point of use filter installation and replacement		
Frequency & Audience:	**31 DAY USE DISPOSABLE WATER FILTER - CAPITAL PROJECTS & MAINTENANCE**		

If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.

General guidance: -

- The filter shall be positioned to avoid or minimise back splash to the outlet in use.
- The filter shall be handled appropriately during installation and touching the filter outlet during use shall be avoided. Use surgical gloves or similar.
- The water jet spray shall not be positioned directly into the sink drainage point.
- The filter outlet shall not be immersed in collected water.
- The external surfaces of the filter and connectors maybe cleansed using sanitising agents containing alcohol. Periodic spraying or wiping of these sampling agents onto the filter housing or housing outlet does not affect the filters integrity.
- During routine water system disinfection the filter can be left in place to enable the outlet to be flushed but a new filter must be installed immediately after flushing and before the outlet is brought back into service.
- Reduction of water flow may occur as a result of heavy contamination of the water with particles, rust or micro organisms. This may reduce the filters lifetime.
- Whilst in use the filter shall not be removed as this could lead to contamination of the downstream side and air entrapment into the filter which may cause air locking and significantly reduce water flow.

Undertake the following process for installing: -

- Remove aerator/flow straightner from screw thread tap outlet.
- Select appropriate quick connect adaptor and attach to tap outlet.
- The peelable label shall be detached to record filter changes and filter date.
- Ensure 'O' ring is in position in groove on filter insert.
- Push filter inlet into adaptor outlet, a click shall be heard.
- Remove the end cap from the filter.
- Water filter may be used for up to thirty one days.
- To remove the filter, push the thumb latch on the adaptor to release.

6.6 Temperature Checks to be Undertaken When Commissioning All Baths, Showers, Sinks Bidets and Wash Basins etc.

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	6	Advice Note:	N/A
Task:	Temperature Checks to be Undertaken When Commissioning		
Frequency & Audience:	**3 DAYS PRIOR TO SECTION AREA RE-OPENING - CAPITAL PROJECTS & MAINTENANCE**		

If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.

On completion of any works, the temperature must be recorded at each water outlet and supply on this attached form.

Complete (a) or (b) as appropriate, with a separate form for each outlet.

A contact thermometer must be used to check the temperature of the supply pipes to any mixing valve.

If any outlet fails to meet the noted temperature requirements it must remain out of use until the required temperatures are met within 1 minute of opening the tap/bidet/shower.

If the above temperatures remain outside the tolerances after rechecking circuit connections and main flow temperatures, the problem must be brought to the attention of the Trust's Officer who is responsible for supervising the scheme, or in the case of directly employed Trust staff, their Supervisor or Engineer Manager.

Note on satisfactory completion of tests this form must be placed in the Health & Safety File and CHF02 Documents by the Principle Contractor. Copies shall also be inserted into the Legionella Log Books by the Responsible Person

Temperature Checks to be Undertaken When Commissioning All Baths, Showers, Bidets and Wash Basins etc.

Scheme Ref (if applicable). _____ Drawing Ref. _____

Block/Bldg _____ Floor _____ Room No. _____

Bath - (44°C),Bidet (37°C), Shower(41°C), or Wash Basin(41°C) (Please state): _____

Reference Number of sanitary ware on drawing

(a) Reduced Temperature Outlet via Thermostatic Mixing Valve (usually fitted in patient areas).

Actual values recorded within 1 minute (°C)

Outlet Temperature _____ Cold Supply _____ Hot Supply _____

Actual values after 2 minutes (°C) **PIPE**

Outlet Temperature _____ Cold Supply _____ Hot Supply _____

Required Values (°C)	41°C	20°C maximum	50°C minimum

(b) Normal Temperature Outlet (No TMV) (usually fitted in non-patient areas).

Actual values recorded within 1 minute (°C)

Hot Tap _____ Cold Tap _____

Actual values after 2 minutes (°C)

Hot Tap _____ Cold Tap _____

Required Values (°C)	50 minimum	20 maximum

Signed _____ Date _____ Company (if applicable) _____

7 PRE-PLANNED MAINTENANCE PROGRAMME - TASK FREQUENCIES

The actual task and frequency of the tasks adopted shall depend on a number of criteria such as the type of building, type of occupants and history of the plant/system. For the specific current frequencies employed across the various Trust buildings, please refer to the PPM Programme Schedule below:

Nottingham University Hospitals NHS Trust			
PPM TASK			PPM TASK FREQUENCIES
CLINICAL RISK EVALUATION OF PATIENTS		Evaluation of the clinical risk of Legionellosis	MANAGED BY CONTROL OF INFECTION AND LIAISED TO ESTATES OPERATIONS TEAM
DWS DISTRIBUTION		Temperature Monitoring	MONTHLY DIRECT-FED SENTINEL OUTLETS
		General inspections of water outlets	MONTHLY CARRIED OUT DURING TEMP MONITORING
		Cleaning and disinfection	AS REQUIRED
DRINKING FOUNTAINS		Temperature Monitoring	MONTHLY
		Microbiological Monitoring *E. coli* and coliforms	QUARTERLY
KNOWN DEAD LEGS AND AREAS OUT-OF-USE		Flushing of Dead Legs	DAILY LOCATIONS DETERMINED BY ESTATES OPERATIONS
INFREQUENTLY USED OUTLETS		Flushing of Infrequently used outlets following 'Usage Evaluation'	DAILY LOCATIONS DETERMINED BY USER
WATER BIOLOGICAL ANALYSIS	Routine sampling	*Legionella spp.* , *Pseudomonas spp.* & TVCC (*E. coli* and coliforms as required)	MONTHLY AT HIGH-RISK LOCATIONS AS DETERMINED BY CONTROL OF INFECTION INCLUDING WPH, HAEMATOLOGY WARDS, RENAL UNITS PRE & POST FLUSH SAMPLES
	By exception and Ad-hoc sampling and during suspected cases and/or outbreaks	*Legionella spp.* , *Pseudomonas spp.* & TVCC (*E. coli* and coliforms as required)	WHEN HWS AND CWS OUTLET TEMPERATURES AND/OR ON-LINE DISINFECTANT ARE PERSISTENTLY OUTSIDE THE RECOMMENDED TEMPERATURE LIMITS PRE & POST FLUSH SAMPLES
			FOLLOW-UP FROM PREVIOUS BIOLOGICAL ANALYSIS "FAILURES" PRE & POST FLUSH SAMPLES
			AS DETERMINED AND

			REQUESTED BY INFECTION CONTROL PRE & POST FLUSH SAMPLES
			AS PART OF AREA OPENING PROCEDURES PRE & POST FLUSH SAMPLES
CHEMICAL SAMPLING (Where chlorine dioxide dosing is installed)		Disinfectant Level	MONTHLY AT DOSING POINT & SELECTED OUTLETS INCLUDING SENTINEL OUTLETS
POINT-OF-USE FILTER INSTALLATION AND REPLACEMENT		Installation/Replacement	WHERE REQUIRED AS DIRECTED BY CONTROL OF INFECTION
WATER STORAGE TANKS		24hr Drop-Test	ANNUALLY
		Temperature Monitoring	WHEN 2 OR MORE DCWS OUTLETS ARE AT >20°C
		Visual Condition Inspections – Patient Area	QUARTERLY
		Visual Condition Inspections – Non-Patient Area	QUARTERLY
		Clean & Disinfection	AS REQUIRED
		Pressurisation Vessels Flushing	WEEKLY
CALORIFIERS TO INCLUDE: i. Indirect storage calorifiers (all vessels ≥75 litres) ii. Direct Gas fired calorifiers iii. Plate heat exchangers Where multiple calorifiers are linked, the monitoring must include the flow and return of EACH unit and not just common flow & return.		24hr Temperature Profiling	ANNUALLY
		Temperature Monitoring of individual Flow & Return – Automatic (Where BMS is fitted)	*CONSTANT ON BMS
		Temperature Monitoring of individual Flow & Return – Manual (Where BMS is not fitted)	MONTHLY
		General visual inspections and Drain Sludge Flushing (All Calorifier types)	QUARTERLY
		Pasteurisation	AS REQUIRED
		Expansion Vessels Flushing	WEEKLY
CISTERN TYPE WATER HEATERS (If present)		Temperature Monitoring	MONTHLY
		Inspection of cold tank section	6-MONTHLY
		Cleaning & Disinfection	AS REQUIRED
LOW VOLUME WATER HEATERS Water heaters of >15 litres storage capacity, including Combination boilers		Temperature Monitoring from unit nearest outlet	MONTHLY
		General visual inspections	6-MONTHLY
INSTANT WATER HEATERS Water heaters of <15 litres storage capacity		Temperature Monitoring from unit nearest outlet	6 MONTHLY
		General visual inspections	6-MONTHLY
THERMOSTATIC MIXING VALVES AND SHOWERS		Temperature monitoring & general condition inspection – Fully bodied immersion	MONTHLY
		Temperature monitoring & general condition inspection – Non-full bodied immersion	6-MONTHLY

	TMV Servicing (Including Clean/Disinfection and Fail-Safe checks)	6-MONTHLY & AS REQUIRED	
	Shower – Head Replacement / Clean and Disinfection	QUARTERLY & AS REQUIRED	
	Clean, Descale & Disinfection	AS REQUIRED	
AIR CONDITIONING/AIR HANDLING	Glass Trap Cleaning	MONTHLY	
	Drip-tray inspections	QUARTERLY	
	Cleaning & Disinfection of Drip Tray, Chiller Batteries and internal Surfaces	6 X MONTHLY	
DRINKING FOUNTAINS AND ICE MAKING MACHINES	Temperature Monitoring	MONTHLY	
FIRE HOSE-REELS (When off DCWS)	Flushing	DAILY	
DENTAL CHAIRS (If present)	Clean and Disinfection	DAILY AND AFTER EACH USE	
	Infrequently Used Chairs Flushing	DAILY	
HYDROTHERAPY POOL	General Inspections and Water Treatment analysis	DAILY	
LATHES/CUTTING TOOLS	Clean and Disinfection	QUARTERLY	
HUMIDIFIED INCUBATORS	Reservoir emptying	DAILY	
	Cleaning and Disinfection	AFTER EACH USE	
PORTABLE HUMIDIFIERS	Reservoir emptying	DAILY	
	Cleaning and Disinfection	AFTER EACH USE	
COOLING TOWERS	PPM TASK	MAKE UP-WATER	COOLING WATER
	Calcium hardness as mg/l $CaCO_3$	MONTHLY	MONTHLY
	Magnesium hardness as mg/l $CaCO_3$	MONTHLY	MONTHLY
	Total hardness as mg/l $CaCO_3$	MONTHLY	MONTHLY
	Total alkalinity as mg/l $CaCO_3$	QUARTERLY	QUARTERLY
	Chloride as mg/l Cl	MONTHLY	MONTHLY
	Sulphate as mg/l SO_4	QUARTERLY	QUARTERLY
	Conductivity µs (Total dissolved solids)	MONTHLY	WEEKLY
	Suspended solids mg/l	QUARTERLY	QUARTERLY
	Inhibitor(s) level mg/l		MONTHLY
	Oxidising biocide mg/l		WEEKLY
	Temperature °C		QUARTERLY
	pH	QUARTERL	WEEKLY

		Y	
	Soluble iron as mg/l Fe	QUARTERLY	QUARTERLY
	Total iron as mg/l Fe	QUARTERLY	QUARTERLY
	Concentration factor		MONTHLY
	Retrieval and replacement of test rack coupons		QUARTERLY
	Cleaning and Disinfection		6-MONTHLY

"As-Required" is determined by the results of each visit and is dependent on various measured parameters such as; physical condition, biological activity (if applicable), temperature, usage frequency etc. and decided by the Trust or its representative All necessary procedures must be pre-agreed prior to commencement.

8 ADVICE NOTES

The advice notes provide information as to the process and tasks involved for undertaking specific duties. It also highlights who is responsible under the frequency such as maintenance or capital projects.

8.1 LEG 01 - Distribution and Outlet Temperature Monitoring

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process Nº:	N/A	Advice Note:	LEG 01
Task:	Distribution and Outlet Temperature Monitoring		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

General

Water temperatures at all outlets, both CWS and HWS, shall be measured at least once annually and a representative number ("direct" fed Sentinel outlets) shall be measured at regular intervals. Temperatures shall be measured after one minute at full flow.

Designated drinking water systems and outlets water temperatures shall be measured at regular intervals. Temperatures must be maintained within +/- 2°C from incoming mains water temperature. Where the water source is from a bore hole or where the temperatures recorded fall outside the recommended temperature limits, the monitoring must be supported with microbiological analysis for the presence of *E.coli* and presumptive coliforms.

Cold Water Systems

The outlet temperature measured after allowing the water to run for 2 minutes shall not exceed 20°C. Where the temperature exceeds 20°C, the cold water temperature at the point of supply shall be measured. When the supply temperature is between 18°C and 20°C, the measured outlet temperature, after running the tap for 2 minutes, shall be less than 2°C higher than that at the point of supply.

Any tap which fails this test must be considered as a potential risk and the whole cold water system shall be investigated. If the point of supply temperature exceeds 20°C, the water company shall be alerted.

On each monitoring visit, the temperature of the mains water source must be measured, including any cold water storage water tank when the CWS temperature at the selected outlets tested is measured and found to exceed 20°C.

Hot Water Systems

The outlet temperature measured after allowing the water to run for 1 minute shall exceed 50°C. Where the temperature fails to reach the required temperature, the source shall be measured and adjusted as necessary, and the Responsible Person Water informed as appropriate.

On each monitoring visit, the temperature of the source supply (Calorifier etc.) must be measured. This must include the "flow" and "return" temperatures of each Unit in the system.

Blended Outlets

The INITIAL and MAXIMUM outlet temperature measured shall NOT exceed:

- 41°C for showers.
- 41°C[1] for washbasins.
- 44°C for bath.
- 46°C[2] for bath.

[1]For washbasins, washing under running water is assumed.
[2]Bath fill temperatures of more than 44°C shall 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 shall be devised to protect vulnerable patients.

Where the temperature exceeds the required temperature, the source shall be measured and adjusted as necessary, and the Responsible Person Water informed as appropriate.

8.2 LEG 02 - Distribution Services Disinfection

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 02
Task:	Distribution Services Disinfection		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies & Capital Projects		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

When disinfecting distribution systems in buildings, it is important to ensure that all persons in the building are notified that the distribution system is being disinfected and that the water must not be used. Outlets shall be taped and signs placed on each outlet advising of this.

NOTE: The Trust will only allow chlorine dioxide as the disinfection agent. Where alternative disinfection agents are intended for use, a written proposal outlining the reasons why an alternative disinfection agent is proposed, the proposed disinfection agent, Control Of Substances Hazardous to Health (COSHH) sheets, risk assessment and methodology must be provided. Alternative disinfection agents shall not be used without prior written consent from the Responsible Person Water.

Disinfection of the System using Chlorine dioxide (ClO2):

- If CWS storage vessels are associated with the system, they shall be cleaned and disinfected by following ADVICE NOTE: LEG 08 before the distribution system is disinfected.
- Any water treatment equipment shall be disconnected from the system.
- Treated water must then be used to charge the distribution system. If a storage vessel is associated with the system, the disinfectant solution must be prepared in and supplied by this vessel. If a storage vessel is not associated with the system, a portable vessel must be used to prepare within and supply from the disinfectant solution.
- Sampling points representative of the system must be tested using a chlorine dioxide test kit to ensure 50 ppm (**ClO2**) throughout the system to start disinfection. The whole system must be allowed to stand charged for a minimum period of 1 hour, a representative number of samples must be taken from the distribution system and tested using chlorine dioxide test kit to ensure levels have been maintained above 30 ppm (**ClO2**). All test and sampling points must be identified and the results of each test recorded.
- The system shall be thoroughly flushed out with clean mains water until tests indicate that the residual chlorine dioxide concentration is no greater than 0.1ppm (**ClO2**).
- Using a suitable sterile container, collect a water sample and submit for biological analysis. The analysis shall measure the presence of contamination by general bacteria (Total Viable Colony Count – TVCC).
- **NOTE: Samples to be collected <u>no earlier than 48 hours</u> following disinfection.**

Neutralisation:
Normally, chlorine dioxide solutions do not require neutralisation prior to disposal to foul sewer unless the system volume is greater than 3000 litres. However, if local conditions require it, 50 ppm disinfectant solutions can be neutralised before disposal with sodium bisulphite (SB) or sodium thiosulphate (ST) at the rate of 350 gm SB/m^3 or 525 gm ST/m^3 of disinfectant solution.
See Appendix C - Certificate of Conformity Check Sheet

8.3 LEG 03 - Microbiological Sampling Requirements

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 03
Task:	Microbiological Sampling Requirements		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies and Capital Projects		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

WATER BIOLOGICAL ANALYSIS	Routine sampling	*Legionella spp.* , *Pseudomonas spp.* & TVCC (*E. coli* and coliforms as required)	MONTHLY AT HIGH-RISK LOCATIONS AS DETERMINED BY CONTROL OF INFECTION INCLUDING HAEMATOLOGY WARDS, RENAL UNITS PRE & POST FLUSH SAMPLES
	By exception and Ad-hoc sampling and during suspected cases and/or outbreaks	*Legionella spp.* , *Pseudomonas spp.* & TVCC (*E. coli* and coliforms as required)	WHEN HWS AND CWS OUTLET TEMPERATURES AND/OR ON-LINE DISINFECTANT ARE PERSISTENTLY OUTSIDE THE RECOMMENDED TEMPERATURE LIMITS PRE & POST FLUSH SAMPLES
			FOLLOW-UP FROM PREVIOUS BIOLOGICAL ANALYSIS "FAILURES" PRE & POST FLUSH SAMPLES
			AS DETERMINED AND REQUESTED BY INFECTION CONTROL PRE & POST FLUSH SAMPLES
			AS PART OF AREA OPENING PROCEDURES PRE & POST FLUSH SAMPLES

Microbiological Sampling Methodology
Microbiological samples shall be collected from representative locations of each system, including plant and equipment, and submitted for analysis in accordance with the protocol below. Microbiological samples shall be collected under the following circumstances:

- When the PPM Programme indicates failure of control parameters.
- When HWS and CWS outlet temperatures are PERSISTENTLY outside the recommended temperature limits.
- As part of BUILDING/Area OPENING procedures.
- Re-sampling following positive biological results.

- During a suspected outbreak.
- During an outbreak (as instructed by the outbreak investigating officer).

Microbiological samples can be analysed for the following organisms:

- *E. coli*
- Coliforms
- TVCC
- *Legionella spp*. (When considered to be necessary)
- *Pseudomonas spp.* (Health Care only and only when considered to be necessary).

Health and Safety Consideration
Sampling of water may occur in a wide variety of locations. Each location and reason for sampling has its own risks associated with it, and it is important to make an assessment of these risks and put appropriate control measures in place before commencing any sampling. Examples of risks include:

- Wet floors that present a slip hazard when sampling from kitchen areas, toilet/rest rooms, cooling towers etc.
- Working at height when ladders/steps are required to reach water sampling points.
- Manual handling risk when carrying large amounts of sampling equipment around.
- Working in confined spaces when sampling from difficult-to-reach parts of water systems.
- *Legionella* infection risk if sampling from water sources that create aerosols, such as cooling towers and showers.

Appropriate precautions shall be taken to minimise aerosol production, as described in BS7592:2008. For example, running taps gently to reduce splashing; using a sterile plastic bag with one corner cut off to enclose the shower head and to funnel the water into a sampling container; sampling cooling towers from sampling points on the return service of the cooling water to the tower, rather than the tower itself.

In addition, some specific safety notes have been included in the sections below.

The following is a list of equipment that may be needed for sampling. The list is not intended to be exhaustive and not all items may be required for all types of sampling.

- Sterile food-grade plastic bags.
- Laboratory supplied sterile sample bottles.
- Labels.
- Permanent waterproof marker pens and biros.
- Laboratory request forms for water samples.
- Nitrile (plastic) gloves.
- Alcohol medical wipes.
- Plastic shoe coverings.
- Cool boxes with separators, temperature data-loggers and 10% by volume of frozen ice-packs (ice packs shall not be used for *Legionella* samples)
- Digital camera.
- Digital voice recorder.
- Calibrated thermometer.
- Calibrated stop-watch
- Calibrated disinfectant residual measuring device (may be colorimetric or electronic type).

Sample Bottles Required for the Collection of Water for Different Microbiological Analysis

Test Required	Sample Bottles

Coliforms, *Escherichia coli, Pseudomonas aeruginosa*, Aerobic Colony Counts, environmental mycobacteria	1 x sterile 500 ml plastic bottle containing an appropriate neutraliser to neutralise any residual disinfectant in the water. *(The most commonly used neutraliser, which is appropriate for chlorinated or brominated water systems and those using ozone or hydrogen peroxide, is sodium thiosulphate. For mains water and hydrotherapy pools, 18 mg/L sodium thiosulphate shall be added.*
Legionella (and other pathogenic bacteria such as *Salmonella*, *Campylobacter* and *E. coli* O157, where required	1 x sterile 1 litre bottle *Or 2 x sterile 500 ml plastic bottles (as above)*

Microbiological Sampling Collection & Submission for Analysis Protocol
Microbiological Sampling must be carried out in accordance with the HPA "DRAFT Guidelines for the Collection and Interpretation of Results from Microbiological Examination of Food, Water and Environmental Samples from the Hospital Environment" 1st June 2010 and BS 7592:2008 - Sampling for Legionella bacteria in water systems – Code of Practice.

The prime objective is to obtain a sample which is representative as far as possible of the water to be examined. To achieve this, certain precautions are necessary which are common to all sampling procedures for the bacteriological examination of water: -

- A suitably UKAS (or equal) accredited laboratory must be used for all samples collected for bacteriological analysis.
- All staff undertaking bacteriological sampling must be suitably and adequately trained in the process of sample collection.
- Good personal hygiene procedures, including thorough washing of hands using soap, must be adopted by the operative prior to the commencement of the exercise.
- Sterile bacteriological sampling bottles must be used containing sodium thiosulphate to neutralise any chlorine in the water to be sampled.
- Scrupulous care shall be taken to avoid accidental contamination of the sample during collection and subsequent handling. Avoid splashing. Ensure the sample bottle does not touch the tap. Do not touch the water as it flows into the bottle or the inside of the cap or bottle. Replace the lid.
- When sampling for *E. coli*, coliforms and TVCC, the outlet (tap/shower) must be disinfected inside (up the spout) and outside with a 1% solution of chlorine, and left for 2 minutes then flushed for 2 minutes, before the sample is collected. This is to ensure that there is no contamination of the water introduced from the outlet.
- It is good practice to establish the water temperature at the time of sampling. Hot water shall reach 50°C within 1 minute at outlets, whilst cold water shall be 20°C or below after running the water for two minutes (Health and Safety Commission, 2000). A calibrated stopwatch and calibrated probe thermometer must be used to measure the temperature of the water to ensure conformity with these guidelines. This information shall be recorded along with the identity of the site and whether or not the outlet was intended to be hot or cold.
- The changes which occur in the bacteriological content of water between the time of sampling and examination shall be reduced to a minimum by ensuring that the sample is not exposed to light, is kept cool in an insulated container (cool-box) and is transported to the laboratory as quickly as possible.
- The sample shall be examined as soon as possible after collection, preferably within six hours but no more than eighteen hours (PHLS 1952, 1953 b).

Every sample bottle must be clearly identifiable, and the following information shall be supplied with the sample:

- Agency requesting the examination
- Sampled by
- Reference number
- Date and time of sampling
- Reason for sampling

- Supply
- Type of water
- Location of sampling point
- Disinfectant residual (to be measured when sampling is carried out following disinfection)
- Pre or Post Flush sample
- Usage frequency
- Temperature of HWS and CWS (HWS and CWS temperature to the TMV must be measured when sample collected from a blended outlet)

Technique of Sampling

Sample Bottles
Sterile bottles, of appropriate volume, shall be provided by the laboratory performing the examination and shall be used exclusively for bacteriological purposes.

All sample bottles provided by the laboratory performing the examination shall contain adequate neutralising agent necessary to neutralise residual chlorine or chloramines.

Order of Collection of Samples – Domestic Water Services
When a number of samples for different purposes are to be taken from the same sampling point, certain precautions are necessary. The sample for bacteriological examination of Legionella spp. shall be collected first unless special investigations are necessary, as, for example, to determine the cause of taste, odours or the concentration of metals in the first flush. For chlorine estimation, a bottle which does not contain thiosulphate shall be used and where possible, this test for chlorine shall be done immediately on site (to be measured when sampling is carried out following disinfection).

To avoid contamination, samples for bacteriological examination shall be kept strictly separate from all others. Boxes for the transport of samples shall be made of materials that can be disinfected regularly. They shall not be used for carrying anything other than samples of water for bacteriological examination.

Opening and filling of Sample Bottles
- Keep the sample bottle unopened until the moment it is required for filling.
- Never rinse out a bottle before taking a sample.
- Loosen the string or rubber band holding the cover in position; hold the bottle by the base in one hand and remove the stopper and cover together with the other hand.
- Retain the stopper and cover in the hand whilst the bottle is filled, and replace them immediately.
- Finally secure the cover.

Sampling from Taps
Good personal hygiene procedures, including thorough washing of hands using soap, must be adopted by the operative prior to the commencement of this exercise.

Taps chosen for sampling shall be clean, free of all attachments and in good repair. Remove all external fitting such as anti-splash devices or hoses where fitted. Remove grease and slime from the tap with a clean swab prior to using the anti-bacterial medical wipe.

Any alteration of the tap setting during sampling shall be avoided as it may have an adverse effect.

A “pre-flush” sample (first draw-off) and a “post-flush” sample (after flushing for at least 2 minutes) must be collected from taps.

When collecting a “pre-flush” sample; alcohol based anti-bacterial medical wipes shall be used to wipe the outlet immediately prior to the collection of the sample. The wipe of the outlet must be carried out in one motion – from the top of the tap to the bottom. A fresh wipe shall be used for each outlet.

When collecting a “post-flush” sample; the outlet must be disinfected inside (up the spout) and outside with a 1% solution of chlorine, and left for 2 minutes then flushed for 2 minutes, before the sample is collected. This is to ensure that there is no contamination of the water introduced from the outlet.

Flaming of the tap is not necessary. If, however, there is an explicit instruction from Control of Infection to do so, then flaming or alternative disinfection of the taps shall be carried out with the supervision of the Control of Infection Officer.

Fill the bottle from a gentle stream. Avoid splashing. Ensure the sample bottle does not touch the tap. Do not touch the water as it flows into the bottle or the inside of the cap or bottle. Replace the lid.

Occasionally, when a tap is turned on, water may leak slightly between the spindle and the gland. This is liable to run down the outside of the tap and, by gaining access to the sample, cause contamination. Under such conditions, no sample for bacteriological examination shall be taken until the leak has been remedied.

Sampling from Showers
Good personal hygiene procedures, including thorough washing of hands using soap, must be adopted by the operative prior to the commencement of this exercise.

A “pre-flush” sample (first draw-off) and a “post-flush” sample (after flushing for at least 2 minutes) must be collected from showers. The “pre-flush” sample must be collected with the shower head in place. The “post-flush” outlets must be collected with the shower head and hose (where practicable) removed.

When collecting a “pre-flush” sample; alcohol based anti-bacterial medical wipes shall be used to wipe the shower head immediately prior to the collection of the sample. The wipe of the shower head must be carried out in one motion – from the top of the tap to the bottom. A fresh wipe shall be used for each shower head.

Create a funnel using a clean food grade bag with a corner cut off using a clean pair of scissors wiped with alcohol based anti-bacterial medical wipes immediately prior to use. Place the showerhead into the bag, seal the open end and put the cut corner into the sample bottle.

If the shower is fed from a hot water system turn the temperature up to maximum. For instant heated showers turn the shower onto the lowest temperature where the heater is used.

Turn the shower on to a gentle flow and fill the bacteriological bottle(s) without rinsing, leaving a small air gap. Avoid splashing. Ensure that the sample bottle does not touch the showerhead. Replace the lid.

Sampling from Tanks
Remove tank lid, avoiding tipping any dirt into the tank.

Good personal hygiene procedures, including thorough washing of hands using soap, must be adopted by the operative prior to the commencement of the sampling. Alternatively, a fresh pair of disposable gloves must also be worn by the operative after the lid has been removed.

Sampling from tanks must be carried out as far from the inlet as possible.

Collect a sample using sterile bottle(s), suitable for collecting samples for bacteriological analysis required by immersing the bottle under the surface of the water, without rinsing, leaving a small air gap. Avoid splashing.

Ensure that the sample bottle does not touch the tank or other structures prior to sample collection.

Do not touch the water as it flows into the bottle or the inside of the cap or bottle.

Ensure that the sample bottle does not touch the tank or other structures following sample collection.

Sampling from Calorifiers
Good personal hygiene procedures, including thorough washing of hands using soap, must be adopted by the operative prior to the commencement of this exercise.

Sampling from calorifiers must be carried from the drain and both; a “pre-flush” sample (first draw-off) and a “post-flush” sample (after flushing for at least 2 minutes) must be collected.
Collect a sample using sterile bottle(s), suitable for collecting samples for bacteriological analysis, without rinsing, leaving a small air gap. Avoid splashing.

Ensure that the sample bottle does not touch the calorifier or other structures.

Do not touch the water as it flows into the bottle or the inside of the cap or bottle.

Sampling from Cooling Water
Good personal hygiene procedures, including thorough washing of hands using soap, must be adopted by the operative prior to the commencement of this exercise.

Samples shall be taken from cooling systems at sample point locations situated on the return service to the cooling water to the tower, and as near as possible to any heat source rather than by removing an inspection hatch and collecting samples from within the tower itself.

General – “Post flush” samples shall be collected from sample taps that have been disinfected. It is important to collect samples at locations that correspond (at the time sampled) to the highest risk – the highest numbers of Legionella occur in circulating water just after the pumps have been switched on. Thus, if possible, samples shall be collected shortly after pumps have initially been switched on. If sediment accumulation is excessive, it might be advisable to sample the sediment.

Supply water - Samples shall be taken of the supply water. Water can be collected either from the float valve at the inlet to the cooling tower pond or from the header cistern. If a water-softening system is incorporated into the system, samples of softened water and water that has not been softened shall be collected.

Cooling circuit with cooling towers - NOTE Legionellae will grow in the warmest part of these systems, which is usually located in the region of the refrigerator condenser or other similar heat exchange equipment. Ideally, a sample point shall be fitted on the return service to the cooling tower, located near to the heat source, for example, just after the refrigerator condenser. If no such sample point is available, then a sample shall be collected from the cooling tower pond at a point furthest removed from the fresh water inlet valve (a tap might be provided at an appropriate point on the side of the pond furthest removed from the fresh water inlet). Samples shall not be taken from the drain valve as part of a routine monitoring programme, as any sample collected might not be representative of the circulating water.

Samples shall be collected, if possible, when the biocide is at its lowest concentration and there is a maximum potential number of legionellae present, for example: -

- when re-circulating pumps have just been started;
- at the time after which any biocidal activity has ceased, and immediately prior to the next biocide addition;
- at the period of time just before any dilution of the water takes place either by automatic or manual operation.

Evaporative condensers - In evaporative condensers, water is circulated from the pond to the top of the tower and returned via a spray system over the heat exchanging system within the tower; in these cases, samples shall only be collected (while the re-circulating pump is running) from the pond at the point furthest removed from the cold water inlet or a dedicated sample point. The dedicated sample point shall be disinfected before sampling.

NOTE 1 - Condensers using softened makeup waters will often have a buffer cistern as part of the circuit. Samples shall not be taken during makeup.

NOTE 2 - Water samples shall be stored between 2 and 8°C. They shall be submitted to the laboratory to ensure that they can be examined promptly, ideally the same day, but always within 24 hours of collection.

Additional Measures (To be followed when collecting Samples for Bacteriological Examination of *Legionella spp.)*

The sampling method for *Legionella* shall be in accordance with ISO11731:1998 and BS7592:2008. A UKAS (or equal) accredited laboratory that takes part in the Health Protection Agency's water external quality assessment (EQA) scheme for the isolation of *Legionella* from water shall test samples (visit http://www.hpaweqa.org.uk for further information). The laboratory shall also apply a minimum theoretical mathematical detection limit of <100 *Legionella* bacteria/litre sample.

All staff undertaking bacteriological sampling must be suitably and adequately trained in the process of sample collection and be aware of the risks of *Legionellosis*. Staff who are likely to be more susceptible to *Legionellosis* **shall not** undertake sampling. It is the responsibility of the operative's manager (this shall apply equally to Trust employees as well as to Contractor staff), to assess their risk of Legionellosis before being assigned the task of sample collection.

Sterile bottles, of 1 litre volume, suitable for collecting samples for bacteriological examination of *Legionella spp.* shall be provided by the laboratory performing the examination.

Collection of samples from taps - follow item **Section Sampling from Taps**

Collection of samples from Showers -follow item **Section Sampling from Showers**

Collection of samples from Tanks: - follow item **Section Sampling from Tanks** and also collect a **further** sample using sterile bottle(s), of 1 litre volume, suitable for collecting samples for bacteriological examination of *Legionella sp* by immersing the bottle under the surface of the water, without rinsing, leaving a small air gap. Avoid splashing.

Collection of samples from Calorifiers: - follow item **Section Sampling from Calorifiers** and also collect a further sample using sterile bottle(s), of 1 litre volume, suitable for collecting samples for bacteriological examination of *Legionella spp.*, without rinsing, leaving a small air gap. Avoid splashing.

Following sampling, all water samples for *Legionella spp*. analysis shall be stored at an ambient temperature (approximately 20°C), in the dark, and returned to the laboratory as soon as possible, preferably the same day but at the latest so that processing can begin within 24 hours of taking the sample. Transporting and/or storing the sample at temperatures below 6 °C might reduce subsequent recovery of legionellae since the bacteria might be induced into a non-culturable state.

Handling and Shipping of Samples
Samples shall be packaged and shipped to the laboratory for analysis as soon as possible. Generally, the shorter the time between sample collection/processing and sample analysis, the more reliable the analytical results will be.

Before shipping samples to the laboratory:

- Check that sample bottles are labelled correctly.
- Pack samples carefully in the shipping container to prevent bottle damage, shipping container leakage, and sample degradation.
- Check that the bottle caps are securely fastened.
- Check that the temperature data-logger is activated and time of activation.

Labelling Sample Bottles
Protocols for labelling, documenting, and packaging samples established by the receiving laboratory must be followed. Obtain authorisation from the laboratory before shipping samples for analysis. Each sample bottle must be correctly labelled with the site/building identification, exact location of sample collection, date, time, and sample designation.

Packaging Samples
When packaging samples for shipment to the laboratory, remember that all bottles must be protected from damage (especially glass bottles) and (or) leaking. The laboratory usually will return with the cooler reusable packing materials such as mesh bags, foam sleeves, and bubble wrap. Plastic bags and cardboard boxes will not be returned. Do not use foam peanuts or vermiculite.

When packaging samples:

- Make sure bottle labels are waterproof and that information is legible.
- Tighten all bottle caps to prevent leakage.
- Use adequate packing material to prevent bottle damage.
- When shipping multiple sets of samples in the same container, label each set of sample bottles with a different letter of the alphabet (A, B, C) so that bottles of each sample set will have the same letter.
- Place all bottles from a sample set into a separate bag (such as plastic or mesh) or bind with a rubber band to keep them together.
- Activate temperature data logger and record time and date of activation.

Shipping Samples
Whenever possible, deliver samples to the laboratory on the day of collection. Check laboratory hours of operation—keep in mind that the laboratory might not receive samples on Saturdays, Sundays, or holidays. The integrity of chilled samples sent late on a Thursday or on a Friday could be compromised if not received by the laboratory in time to be unpacked and refrigerated. Upon delivery, interrogate temperature data logger and record duration of delivery and highest and lowest temperature of cool box during that time. If the time taken to deliver the samples exceed the maximum recommended submission time, the samples must be discarded and the collection process repeated. If the temperatures of the cool box during delivery fall outside the recommended limits, the samples must be discarded and the collection process repeated.

Biological Analysis Process Auditing
The Legionella Consultant shall carry out an audit on the following:

- Training records of each field operative to ensure adequate training level.
- Visually check and confirm the correct collection of each type of sample.
- Calibration certificate status of all instruments used in the process.
- Inspect and confirm suitable condition of cool boxes.
- Visually check and confirm the correct packaging of collected samples.
- Visually check and confirm the correct monitoring of the submission time and cool box temperature of the sample.
- Check and confirm that the laboratory has no issues with samples received.

8.4 LEG 04 - Chemical Sampling

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 04
Task:	Chemical Sampling where chlorine dioxide (CIO2) is installed		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

The point of introduction of the disinfectant solution into the system shall be tested using a chlorine dioxide test kit to ensure 0.5 – 0.25 ppm (**ClO_2**) throughout the system.

Additional sampling points (sentinel locations) representative of the system shall be tested using a chlorine dioxide test kit to ensure 0.5 – 0.25 ppm (**ClO_2**) throughout the system.

8.5 LEG 05 - Water Storage Tank - 24hr Drop-Test

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 05
Task:	Water Storage Tank - 24 hr Drop-test		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Cold water storage tanks shall be sized and arranged so as to minimise retention time of stored water (12 hrs maximum), and therefore to increase the rate of stored water exchange.

Cold water storage tanks shall be subjected to a periodic “need” test which requires the user to question the presence of each unit and consider its removal if the services it supplies can be, equally well, supplied by converting the systems to domestic Mains fed only.

Each unit shall be subjected to an annual “drop-test” designed to ascertain the capacity and demand requirements of each system, in order to ensure that excessive volumes of water are not unnecessarily stored: -

- When the tank is full and no water is entering via the inlet, measure the height of the water level in the tank - (A); from the bottom of the tank to the level of water.
- During the identified period of maximum demand, isolate the supply to the tank and immediately mark the level of water within the tank using a non-deleterious marker.
- After one hour, re-mark the level of water within the tank using a non-deleterious marker and measure the “height” of water used in the one hour – (B).
- Divide the height of the water level in the tank - (A) by the “height” of water used in the one hour – (B) to calculate the total capacity of water in hours.
- **NOTE: When tanks are linked, the process above must be carried out for the “combined” volume.**

8.6 LEG 06 - Water Storage Tank - Temperature Monitoring

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 06
Task:	Water Storage Tank - Temperature Monitoring		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Using a calibrated thermometer, measure and report the following:

- Ambient (external temperature).
- Tank room temperature.
- Stored water temperature (Temperature of the tanked water shall be monitored via the drain point if practicable).
- Supply temperature.
- **NOTE: Remember to measure and record temperature reading from as far away from the ball cock as possible. Care must be taken not to contaminate the stored water by the use of unclean temperature probes.**

8.7 LEG 07 - Water Storage Tank - Visual General Inspection

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process Nº:	N/A	Advice Note:	LEG 07
Task:	Water Storage Tank - Visual General Inspection		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Using a calibrated thermometer, measure and report the following:

- Ambient (external temperature).
- Tank room temperature.
- Stored water temperature (Temperature of the tanked water shall be monitored via the drain point if practicable).
- Supply temperature.
- Visually inspect tank room for bird and/or rodent infestation and state amount.
- If insulation allows for inspection of the external condition of the tank walls, inspect for corrosion pitting and leaks.
- Visually inspect internal walls of tank for signs of scale deposition, corrosion and slime deposits.
- Visually inspect tank and associated valves/pipework for leaks.
- Visually inspect bottom of tank for sludge deposition and state amount.
- Visually inspect internal walls of tank for corrosion and state amount.
- Visually inspect for signs of stagnation such as water surface dirt, oil films, insects, smell, low input.
- Visually inspect water surface for; dirt, oil films, insects and state amount.
- Visually inspect for slimy deposits on the internal walls of tank and state the colour of substance and state amount.
- Visually inspect for algae growth indicated by either green or red plant like growth on water surface.
- Visually inspect the insulation for signs of wear and tear and areas where the insulation has been removed.
- Visually inspect that the lid is correctly fitted and that any bolts are securely tightened.
- Visually inspect that all insect/rodent screens fitted are clear from debris so that water can flow easily.
- Visually inspect that the ball valve opens and closes correctly.
- Visually inspect all pipework for signs of corrosion and leaks, and check the condition of insulation fitted.
- Visually inspect all valves for correct operation, signs of corrosion and leaks.
- Visually inspect all booster pumps fitted for correct operation.
- Indicate the date that the tank was last cleaned and disinfected and indicate whether it was disinfected as routine or due to adverse conditions.

8.8 LEG 08 - Water Storage Tank - Cleaning and Disinfection

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 08
Task:	Water Storage Tank - Cleaning and Disinfection		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies & Capital Projects		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Tank Cleaning
The pH of the water shall be measured and must be between 5.5 and 9.0 before chlorinating solution is introduced. If pH is found to be below 5.5 the system shall be drained, flushed and refilled with fresh water.

The tank(s) shall be filled with fresh water and chlorinating agent to give a minimum free chlorine concentration of 50ppm (50mg/l), and when full, allowed to stand for 1 hour.

After 1 hour, measure free chlorine level, if free chlorine level is below 30ppm, repeat above step.

The tank(s) shall be drained and then thoroughly flushed out with clean mains water until tests indicate that the residual chlorine concentration is no greater than 0.5ppm (0.5mg/l), or that present in the mains water supply.

Where the volume exceeds 2000 litres, the disinfected water must be neutralised, using sodium thiosulphate, before disposal. The neutralised waste MUST NOT be drained through the system.

Fix ball valve in close position.

Isolate Tank from system, outlets must be sealed from inside tank.

Empty the Tank via drain-point or by using a submersible or barrel type pump, in the absence of a drain-point or if draining from drain-point is impracticable.

Clean Tank and remove all deposits of scale, corrosion and sludge deposition using a combination of hand scraping and brushing together with application of chemicals to dissolve or soften the scale (where necessary). Vacuum out all loose debris and deposits.

When using high-pressure jet washers to clean the internal surfaces of the Tank, suitable PPE must be used, including a positive pressure respirator. In this circumstance, the escape of aerosols must be restricted or minimised.

Where oil and grease contaminants on the tank surface are implicated, they shall be removed using suitable de-greasants. Where necessary (and practicable) the tank can be steam cleaned to remove grease contaminants.

Where “significant” or “highly-significant” levels of biological contamination is reported, the Tank shall be disinfected (using the disinfection method below), before the cleaning process is commenced.

Tank Disinfection Using Sodium Hypochlorite
The pH of the water shall be measured and must be between 5.5 and 9.0 before chlorinating solution is introduced. If pH is found to be below 5.5 the system shall be drained, flushed and refilled with fresh water.

The tank(s) shall be filled with fresh water and chlorinating agent to give a minimum free chlorine concentration of 50ppm (50mg/l), and when full, allow to stand for 1 hour.

After 1 hour, measure free chlorine level, if free chlorine level is below 30ppm, repeat above step.

The tank(s) shall be drained and then thoroughly flushed out with clean mains water until tests indicate that the residual chlorine concentration is no greater than 0.5ppm (0.5mg/l), or that present in the mains water supply.

Where the volume exceeds 2000 litres, the disinfected water must be neutralised, using sodium thiosulphate, before disposal. The neutralised waste MUST NOT be drained through the system.

The tank is to be refilled with fresh water via the inlet ball valve(s).

Using a suitable sterile container, collect a water sample and submit for biological analysis. The analysis shall measure the presence of contamination by general bacteria (Total Viable Colony Count – TVCC). Samples to be collected no earlier than 48 hours following disinfection.

Tank Disinfection Using Chlorine Dioxide (ClO_2) – Soaking Method
Once the activated solution is in the system and adequately mixed, check that a reserve of at least 50mg/L as ClO2 is given. Add more activated solution if necessary.

Draw chlorinating agent from all outlets and ensure the presence of at least 50ppm ClO_2. After 1 hour, check ClO_2 level, if below 30ppm, repeat above steps. If level is >30ppm ClO_2, after one hour flush system with fresh water and put to drain.

The tank(s) and system shall be thoroughly flushed out with clean mains water until tests indicate that the residual ClO_2 concentration is no greater than 0.5ppm (0.5mg/l), or that present in the mains water supply.

After the one hour soak period, the system can be drained and flushed out and provided the system volume is less than $2m^3$ and the residual less than 20mg/L as ClO_2 can be discharged to sewer without deactivation. For larger volumes/higher residuals then this shall be deactivated using Sodium Thiosulphate solution.

The area of the storage vessel above the water line (overflow, lid, ball valve etc) shall be manually cleaned and then disinfected by spraying with 500 ppm ClO_2 solution using garden type pressure sprayer ensuring surfaces remain wet for 10 minutes

If the water volume is less than $2m^3$ and the residual ClO_2 content is less than 20 mg/L as ClO_2 then it is acceptable to discharge the water to sewer without further deactivation.

The tank is to be refilled with fresh water via the inlet ball valve(s).

Using a suitable sterile container, collect a water sample and submit for biological analysis. The analysis shall measure the presence of contamination by general bacteria (Total Viable Colony Count – TVCC). Samples to be collected no earlier than 48 hours following disinfection.

Tank Disinfection Using Chlorine Dioxide – Spray Method
Spray all surfaces of the tank using a knapsack or garden pressure sprayer or fogger, with ready prepared 500ppm ClO_2 solution, ensuring that all surfaces remain wet with disinfectant for at least 10 minutes. Note the requirements for personal protective equipment when spraying of fogging chlorine dioxide solutions.

When the spray disinfection is complete and the solution has been in contact with all surfaces for at least 10 minutes, thoroughly rinse all sprayed surfaces with clean water and remove any residues with pump/wet vac or flush through to drain.

Refill with fresh water and put back into service. Check residual of chlorine dioxide is below 1ppm as ClO_2.

Using a suitable sterile container, collect a water sample and submit for biological analysis. The analysis shall measure the presence of contamination by general bacteria (Total Viable Colony Count – TVCC). Samples to be collected no earlier than 48 hours following disinfection.

See Appendix C - Certificate of Conformity Checksheet

8.9 LEG 09 - Pressurisation Vessel Flushing

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 09
Task:	Pressurisation Vessel Flushing		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Doubts have been expressed about the desirability of using single entry pressurisation vessels on cold water systems. The use of single entry pressurisation vessels effectively forms a vertical dead-leg through which there is no flow of water and concern has been expressed about the possibility of bacterial growth within the vessel. It is considered preferable therefore, that a pressurisation vessel with both inlet and outlet connections be installed, wherever practicable, so that the water content of the vessel is constantly changed. This will also allow for compliance with BS6144:2006 and BS6920-4:2001.

Where pressurisation vessels are of the single entry type they must be fitted with appropriate drain valves to facilitate flushing of the unit on at least Weekly basis.

All vessels shall be flushed at least weekly for long enough to ensure adequate replacement of its contents.

Care must be taken to avoid damage to the diaphragm.

8.10 LEG 10 - Storage Calorifiers - 24hr Temperature Profiling

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 10
Task:	Storage Calorifiers - 24 Hr Temperature Profiling		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Operating temperatures of storage calorifiers must be maintained within the following limits:

- Flow Temperature: ≥60°C
- Return Temperature: ≥55°C
- Drain Temperature: ≥60°C
- Cold Feed Temperature <20°C

Where the unit is monitored using BMS, collect the readings of all the fields listed above, for at least a 24hr period and consider the results. Adjust control parameters as necessary.

Where the unit is not monitored using BMS, attach a data-logger on the flow, return, and cold feed and collect temperature data for at least a 24hr period and consider the results. Adjust control parameters as necessary and the frequency and duration of temperature logging dependent upon results.

8.11 LEG 11 - Storage Calorifiers - Temperature Monitoring

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 11
Task:	Storage Calorifiers - Manual Temperature Monitoring		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Measure and record the "Set" temperature setting of the thermostat (if fitted and calibrated). Temperature to exceed 60°C.

Measure and record the "Flow" temperature using a contact thermometer or fitted gauge. Temperature to be taken from "Flow" pipework as close to the Calorifier as possible. Temperature to exceed 60°C.

Measure and record the "Return" temperature using a contact thermometer or fitted gauge. Temperature to be taken from "Return" pipework as close to the Calorifier as possible. Temperature to exceed 55°C.

Isolate Cold Feed and open drain point and measure and record temperature. Temperature to exceed 60°C.

Measure and record the "Cold Feed" temperature using a contact thermometer or fitted gauge. Temperature to be taken from "Cold Feed" pipework one metre from the Calorifier. Temperature NOT to exceed 20°C.

NOTE: If contact probe is to be used for temperature monitoring through copper pipework, a 2°C temperature adjustment must be added to the recorded temperature before reporting temperature on the Log-sheet.

NOTE: The temperature measurements shall be carried out at different times during the day in order to allow indicative temperature monitoring of the vessel during a typical daily usage profile.

8.12 LEG 12 - Storage Calorifiers - Visual General Inspection (Including Drain Flushing)

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 12
Task:	Storage Calorifiers - Visual General Inspection (Including Drain Flushing)		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Ensure operational status of Calorifier by checking the status of the associated isolation valves.

If the Calorifier is OFF, indicate the date it came Off-line.

Confirm status of Inlet Valve.

Confirm status of Outlet Valve.

Confirm the operational status of the circulation pump(s).

Confirm the operational status of the shunt pump(s).

Visually inspect Calorifier and associated valves for leaks.

Visually inspect all pipework for signs of corrosion and leaks, and visually inspect the condition of insulation fitted. Visually inspect all valves for correct operation, signs of corrosion and leaks.

Visually inspect all pumps fitted for correct operation and leaks.

Measure and record the temperature setting of the thermostat (if fitted).

Measure and record the “flow“ temperature using a contact thermometer or fitted gauge. Temperature to be taken from “flow” pipework as close to the Calorifier as possible.

Measure and record the “return“ temperature using a contact thermometer or fitted gauge. Temperature to be taken from “return” pipework as close to the Calorifier as possible.

Isolate CW feed and open drain point into a bucket and collect approximately the 1st litre of water discharged. Measure and record the condition, viscosity and colour of this water.

Check for colour, viscosity and sludge deposition amount. Measure and record the temperature of the water.

Using a contact thermometer, measure and record the temperature of the calorifier at; the top, middle and bottom. If there is more than 5°C difference between the top temperature and the bottom temperature then the calorifier is suffering from temperature stratification. If a contact thermometer cannot be used, then measure and record the difference in the “flow” temperature and the “drain” temperature.

Visually inspect the insulation for signs of wear and tear and areas where the insulation has been removed.

Visually inspect that any gauges fitted are operating correctly. Compare against calibrated instruments.

Open the CW feed valve and then open the drain point allowing enough water to flow through so that any water discoloration is removed.

8.13 LEG 13 - Storage Calorifiers - Pasteurisation

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 13
Task:	Storage Calorifiers - Pasteurisation		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies & Capital Projects		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Purge Calorifier via drain point and refill.

Isolate all valves on the incoming and outlet sides.

Ensure that the pressure release "blow" valve is capable of withstanding temperatures of up to 80°C.

Bring Calorifier to 70°C (if practicable) and allow to stand at this temperature for at least 1 hour. Where this is not possible an alternative means of disinfection shall be used.

Ensure that no water is drawn from the Calorifier whilst pasteurisation in progress.

Allow Calorifier to reach its normal operating temperature, ≥60°C, and return to service.

Using a suitable sterile container, collect a water sample and submit for biological analysis. The analysis shall measure the presence of contamination by general bacteria (Total Viable Colony Count – TVCC). Samples to be collected no earlier than 48 hours following pasteurisation.

See Appendix C - Certificate of Conformity Checksheet

8.14 LEG 14 - Expansion Vessel Flushing

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 14
Task:	Expansion Vessel Flushing		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Doubts have been expressed about the desirability of using single entry expansion vessels on hot water systems. The use of single entry expansion vessels effectively forms a vertical dead-leg through which there is no flow of water and concern has been expressed about the possibility of bacterial growth within the vessel. It is considered preferable therefore, that an expansion vessel with both inlet and outlet connections shall be installed, wherever practicable, so that the water content of the vessel is constantly changed. This will also allow for compliance with BS 6144 and BS 6920-4:2001.

Where expansion vessels are of the single entry type they must be fitted with appropriate drain valves to facilitate flushing of the unit on at least Weekly basis.

All vessels shall be flushed at least weekly for long enough to ensure adequate replacement of its contents.

Care must be taken to avoid damage to the diaphragm.

8.15 LEG 15 - Cistern Type Water Heaters - Temperature Monitoring

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 15
Task:	Cistern Type Water Heaters - Temperature Monitoring		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Measure and record the "Set" temperature setting of the thermostat (if fitted and calibrated). Temperature to be at least 60°C.

Measure and record the temperature of the furthest outlet supplied by the unit. Temperature to be at least 50°C within 1 min.

NOTE: If contact probe is to be used for temperature monitoring through copper pipework, a 2°C temperature adjustment must be added to the recorded temperature before reporting temperature on the Log-sheet.

NOTE: The temperature measurements shall be carried out at different times during the day in order to allow indicative temperature monitoring of the vessel during a typical daily usage profile.

8.16 LEG 16 - Cistern Type Water Heaters - Inspection of Tank Section

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 16
Task:	Cistern Type Water Heaters - Inspection of Tank Section		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

If casing allows for inspection of the external condition of the unit walls, inspect for corrosion pitting and leaks.

Visually inspect tank and associated valves/pipework for leaks.

Visually inspect bottom of tank for sludge deposition and state amount.

Visually inspect internal walls of tank for corrosion and state amount.

Visually inspect water surface for; dirt, oil films, insects and state amount.

Visually inspect for slimy deposits on the internal walls of tank and state the colour of substance and state amount.

Visually inspect for algae growth indicated by either green or red plant like growth on water surface.

Visually inspect the insulation for signs of wear and tear.

Visually inspect that the lid is correctly fitted.

Visually inspect that all insect/rodent screens fitted are clear from debris so that water can flow easily.

Visually inspect that the ball valve opens and closes correctly.

Visually inspect all pipework for signs of corrosion and leaks, and check the condition of insulation fitted.

Indicate the date that the tank was last cleaned and disinfected and indicate whether it was disinfected as routine or due to adverse conditions.

8.17 LEG 17 - Cistern Type Water Heaters - Clean and Disinfection

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 17
Task:	Cistern Type Water Heaters - Clean and Disinfection		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Clean Tank and remove all deposits of scale, corrosion and sludge deposition using a combination of hand scraping and brushing together with application of chemicals to dissolve or soften the scale (where necessary). Vacuum out all loose debris and deposits.

The pH of the water shall be measured and must be between 5.5 and 9.0 before chlorinating solution is introduced. If pH is found to be below 5.5 the system shall be drained, flushed and refilled with fresh water.

The tank section of the unit shall be filled with fresh water and chlorinating agent to give a minimum free chlorine concentration of 50ppm (50mg/l).

Draw chlorinating agent from all outlets supplied by the unit and ensure the presence of at least 50ppm free chlorine at each outlet. After 1 hour, check free chlorine level, if free chlorine level is below 30ppm, repeat steps ii & iii. If level is >30ppm free chlorine, after one hour flush system with fresh water and drain.

Refill cistern with fresh water via inlet valve.

Using a suitable sterile container, collect a water sample and submit for biological analysis. The analysis shall measure the presence of contamination by general bacteria (Total Viable Colony Count – TVCC). Samples to be collected no earlier than 48 hours following disinfection.

8.18 LEG 18 - Low Volume Water Heater >15 litres - Temperature Monitoring

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 18
Task:	Low Volume Water Heater >15 litres - Temperature Monitoring		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Measure and record the "Set" temperature setting of the thermostat (if fitted and calibrated). Temperature to be at least 60°C.

Measure and record the temperature of the furthest outlet supplied by the unit. Temperature to be at least 50°C within 1 minute.

NOTE: If contact probe is to be used for temperature monitoring through copper pipework, a 2°C temperature adjustment must be added to the recorded temperature before reporting temperature.

NOTE: The temperature measurements shall be carried out at different times during the day in order to allow indicative temperature monitoring of the vessel during a typical daily usage profile.

8.19 LEG 19 - Combination Boiler - Temperature Monitoring

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 19
Task:	Combination Boiler - Temperature Monitoring		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Measure and record the "Set" temperature setting of the thermostat (if fitted and calibrated). Temperature to be at least 60°C.

Measure and record the temperature of the furthest outlet supplied by the unit. Temperature to be at least 50°C within 1 minute.

NOTE: If contact probe is to be used for temperature monitoring through copper pipework, a 2°C temperature adjustment must be added to the recorded temperature before reporting temperature.

NOTE: The temperature measurements shall be carried out at different times during the day in order to allow indicative temperature monitoring of the vessel during a typical daily usage profile.

8.20 LEG 20 - Instant Water Heater <15 litres - Temperature Monitoring

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 20
Task:	Instant Water Heater <15 litres - Temperature Monitoring		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Units of this type, because of the limited stored water volume, do not usually need to be operated within the temperature profile and limits prescribed for larger systems (≥60°C for the 'flow' and ≥50°C for the 'return' and 'outlet') which are necessary for thermal disinfection.

It may be possible to operate these units at "safe" temperatures of ≤41.0^{o}C although they must be switched-on at all times to ensure and encourage adequate use. However, infrequent use of these units (less than daily) would increase the potential of bacterial growth and proliferation (as would be the case in all infrequently used areas throughout the system – both hot and cold), although particularly in this case because of the low temperatures operated.

8.21 LEG 21 - Thermostatic Mixing Valves (TMV) - Temperature Monitoring

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 21
Task:	Thermostatic Mixing Valves (TMV) - Temperature Monitoring		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Showers, Baths and Bidets

Measure and record the "Initial" and "Final" outlet temperature, of each shower and bath fitted with a TMV. The measurements shall be carried out immediately and after allowing the water to run for 1 minute at full-flow respectively. The "Initial" and "Final" outlet temperature measured shall not to exceed:

- Showers: 41°C
- Baths: 44°C
- Bidets: 37°C

Where these temperatures are exceeded, the TMV shall be adjusted in order to allow the unit to operate within the recommended temperature limits described above.

Using an electronic and calibrated thermometer with a suitable contact probe, measure and record the temperature of the HWS and CWS supply pipes of each TMV. The temperature of the CWS shall not exceed 20°C and the temperature of the HWS shall not be less than 50°C. The measurements shall be carried out following the above process.

Sinks, Basins and Other Non Full Body Immersion Outlets

Measure and record the "Initial" and "Final" outlet temperature, of the HOT water outlet of each sink, basin and other non-full body immersion outlets fitted with a TMV. The measurements shall be carried out immediately and after allowing the water to run for 1 minute at full-flow respectively. The "Initial" and "Final" outlet temperature measured shall not exceed 41°C.

Where these temperatures are exceeded, the TMV shall be adjusted in order to allow the unit to operate within the recommended temperature limits described above.

Using an electronic and calibrated thermometer with a suitable contact probe, measure and record the temperature of the HWS supply pipe ONLY of each TMV. The temperature of the HWS shall not be less than 50°C. The measurements shall be carried out following the above process.

Measure and record the COLD water outlets of each sink, basin and other non-full body immersion outlets fitted with a TMV. The measurements shall be carried out immediately and after allowing the water to run for 2 minutes at full-flow respectively. The outlet temperature measured shall not exceed 20°C.

8.22 LEG 22 - Thermostatic Mixing Valves (TMV) - General Condition Inspections and Servicing

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 22
Task:	Thermostatic Mixing Valves (TMV) - General Condition Inspections and Servicing		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Inlet check valves (if fitted): Measure inlet pipework surface temperature for indication of cross-flow. A more effective test can be considered if appropriate, utilising drain points positioned between isolating and check-valves

Temperature measurements: a) locked; b) adjustable/pre-set maximum, Operate flow controls and measure blended temperature. Measure maximum and minimum blended temperature. For thermostat and pressure-balanced mixers, blend temperature shall stabilise quickly and remain within +2°C of set value. For manual mixers, refer to commissioning data.

Thermal shut-down (Thermostatic valves only): Operate mixer at blended temperature, then isolate cold supply. Valve must shut down in accordance with the manufacturer's data.

Temperature control: Operate mixer at blended temperature, then open other local cold outlets off common supply. Measure shift in blend temperature with reference data compiled at the commissioning stage.

Strainers: Isolate and visually inspect and clean as necessary.

Flow control(s): Operate fully and check for effective closure. If time delay is incorporated, measure length of flow cycle.

Automatic drain valve (if fitted): Check effective operation.

Mixing valve: a) temperature control; b) flow control(s); c) inlet check valves. Where specified by manufactures guidance and/or site conditions and inspection confirms the requirement, carry out visual inspection of internal serviceable mechanisms. Clean or renew components as necessary. Lubricate as indicated in manufacturer's data. Refer to manufacturer's data for recommended procedures and cleaning agents/lubricants. For products of (serviceable) cartridge construction, fit and commission exchange units if required.

Service displaced units in workshop as part of rolling planned maintenance procedure.

Supply pipe-work: Visually inspect for damage leaks, etc. and rectify.

For all new installations, record the supply pressures to allow the appointed person to compare these pressures and temperatures to confirm agreement with commissioning data.

Controls: Operate inlet valves and check individual flow rates of hot and cold water supplies. If valve is stripped down and reassembled all parts shall be greased as recommended in the manufacturer's maintenance instructions.

Thermostat: Check mixed water outlet setting. Ensure thermometer bulb is immersed in flowing water if measurement taken at shower head.

Temperature limiter: Measure mixed water outlet temperature at limit safety stop. Limiter setting 41°C.

Inlet check valves (where fitted): Check operation. Non-return valves may have been removed if operating with balanced pressure supplies).

8.23 LEG 23 - Thermostatic Mixing Valves (TMV) - Clean, Descale and Disinfection

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 23
Task:	Thermostatic Mixing Valves (TMV) - Clean, Descale and Disinfection		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

When site conditions are found to result in scale build-up within a valve, the valve shall be de-scaled and disinfected as per this specification to a frequency determined by site tests and inspections.

Each TMV shall be removed from its location and replaced with a new or previously serviced TMV. The removed TMV shall be taken to a suitably equipped work-shop for service.

At the work-shop, each TMV shall be dismantled and physically cleaned from all scale deposits and scale deposition (using a suitable de-scaling solution where necessary).

All components shall be disinfected (this applies to all cleaned and new components). All components shall be flushed with clean water and immersed in a Sodium hypochlorite disinfectant solution (100 ppm) for 20 minutes minimum.

Remove components from disinfectant solution and rinse with clean water to remove presence of chlorine.

Reassemble, refit and test operation of valve, including fail-safe test.

Rinse in clean water, allow to drip-dry and store in a cool and dry place.

8.24 LEG 24 - Shower - Temperature Monitoring

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 24
Task:	Shower - Temperature Monitoring		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Measure and record the “Initial” and “Final” outlet temperature, of each shower fitted with a TMV. The measurements shall be carried out immediately and after allowing the water to run for 1 minute at full-flow respectively. The “Initial” and “Final” outlet temperature measured shall not to exceed 41°C.

Where this temperature is exceeded, the TMV shall be adjusted in order to allow the unit to operate within the recommended temperature limits described above.

Using an electronic and calibrated thermometer with a suitable contact probe, measure and record the temperature of the HWS and CWS supply pipes of each TMV.

The temperature of the CWS shall not exceed 20°C and the temperature of the HWS shall not be less than 50°C. The measurements shall be carried out following the process above.

8.25 LEG 25 - Shower - Head Replacement / Clean and Disinfection

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 25
Task:	Shower - Head Replacement / Clean and Disinfection		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Examine shower head for signs of dirt, scale and slime deposition.

If any of the above is considered to be significant, replace existing shower head with new, packaged shower head and dispose of the old shower head in an appropriate manner.

Shower Head Clean and Disinfection
Each shower-head and associated hose (where fitted) shall be removed from its location and replaced with a new or previously serviced shower-head. The removed unit shall be taken to a suitably equipped work-shop for service.

At the work-shop, each shower-head and associated hose shall be dismantled and physically cleaned from all scale deposits and scale deposition (using a suitable de-scaling solution where necessary on the shower-head only).

Rinse in clean water.

All components shall be disinfected (this applies to all cleaned and new components). All components shall be flushed with clean water and immersed in a Sodium hypochlorite disinfectant solution (100 ppm) for 20 minutes minimum.

Remove components from disinfectant solution and rinse with clean water to remove presence of chlorine.

Rinse in clean water, allow to drip-dry and store in a cool and dry place

NOTE: It is the Trust's Policy to replace shower heads every 6-months.

8.26 LEG 26 - Air Conditioning / Air Handling - Glass Trap Cleaning and Disinfection

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 26
Task:	Air Conditioning / Air Handling - Glass Trap Cleaning and Disinfection		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Each trap shall be removed from its location and taken to a suitably equipped work-shop for service.

At the work-shop, each trap shall be dismantled and physically cleaned from all scale deposits and scale deposition (using a suitable de-scaling solution where necessary).

Rinse in clean water.

All components shall be disinfected (this applies to all cleaned and new components). All components shall be flushed with clean water and immersed in a Sodium hypochlorite disinfectant solution (100 ppm) for 20 minutes minimum.

Rinse in clean water, allow to drip-dry and store in a cool and dry place.

8.27 LEG 27 - Air Conditioning / Air Handling - General Inspection, Clean and Disinfection

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 27
Task:	Air Conditioning / Air Handling - General Inspection, Clean and Disinfection		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Report on the operational status of the unit.

Visually inspect the condition of the external surfaces of the unit and comment.

Visually inspect (if possible) the condition of the internal surfaces of the unit and comment. If practicable, isolate unit in order to allow for thorough internal inspection to be carried out.

Visually inspect the condition of all traps fitted and comment.

Visually inspect (if possible) the condition of the drip-trays of the unit and comment. If practicable, isolate unit in order to allow for thorough internal inspection of the drip-trays to be carried out. Alternatively, remove drip-trays from the system and inspect.

Visually inspect (if possible) the condition of the drip-tray drains of the unit and comment.

Visually inspect (if possible) the condition of the eliminators of the unit and comment.

Visually inspect (if possible) the condition of the filters fitted and comment.

Visually inspect (if possible) the condition of the humidifier components of the unit and comment.

Visually inspect (if possible) the condition of the Chiller battery fitted and comment.

Visually inspect (if possible) the condition of the Heater battery and comment.

Using clean cloth, wipe over the unit components to be disinfected. To disinfect, spray the components with a chlorine donor solution of 500 ppm strength, using small hand spray. Allow to stand for 3 minutes only. Spray with fresh clean water.

Dry area with clean and clean cloth.

8.28 LEG 28 - Cooling Tower Chemical Water Treatment General Requirements

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 28
Task:	Cooling Tower Chemical Water Treatment General Requirements		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

This applies to all the site evaporative cooling towers and their systems.

It is necessary to add chemicals and biocides to evaporative cooling systems in order to avoid the presence of scale and corrosion. It is also necessary to use some form of biocidal treatment to restrict the growth of bacteria and algae in the systems.

This is really only good housekeeping, but it must be remembered that bacteria, and Legionella in particular, thrive in dirty systems.

The following are required:

- A scale inhibitor (unless external softening is in use)
- A corrosion inhibitor
- Two alternating non-oxidising biocides OR
- A single oxidising biocide.

The chemicals shall be added automatically, and shall be used in direct proportion to the cooling tower make up.

In addition, there shall be a blowdown, designed to control the system concentration. This can be manual, but really ideally to be automatic and linked to the system Total Dissolved Solids if it is to be effective. Over-concentration leads to deposition and contamination.

The MSDS sheets for these products, the production of which are a requirement of the Control of Substances Hazardous to Health Act are to be found in the Appendix of the site Legionella Code of Practice. They shall also be maintained in the cooling tower log book.

The use of the chemicals shall be such that the minimum quantity is used whilst complying with the Water Treatment Specification.

8.29 LEG 29 - Cooling Tower Chemical Water Treatment General Requirements

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 29
Task:	Cooling Tower Chemical Water Treatment General Requirements		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

A specialist from the Water Treatment Contractor is required by contract to attend site and shall carry out the following:

PPM TASK	MAKE UP-WATER	COOLING WATER
Calcium hardness as mg/l $CaCO_3$	MONTHLY	MONTHLY
Magnesium hardness as mg/l $CaCO_3$	MONTHLY	MONTHLY
Total hardness as mg/l $CaCO_3$	MONTHLY	MONTHLY
Total alkalinity as mg/l $CaCO_3$	QUARTERLY	QUARTERLY
Chloride as mg/l Cl	MONTHLY	MONTHLY
Sulphate as mg/l SO_4	QUARTERLY	QUARTERLY
Conductivity µs (Total dissolved solids)	MONTHLY	WEEKLY
Suspended solids mg/l	QUARTERLY	QUARTERLY
Inhibitor(s) level mg/l		MONTHLY
Oxidising biocide mg/l		WEEKLY
Temperature °C		QUARTERLY
pH	QUARTERLY	WEEKLY
Soluble iron as mg/l Fe	QUARTERLY	QUARTERLY
Total iron as mg/l Fe	QUARTERLY	QUARTERLY
Concentration factor		MONTHLY
Retrieval and replacement of test rack coupons		QUARTERLY
Cleaning and Disinfection		6-MONTHLY

In addition, ensure that:

- Record if Towers are in use.
- Initiate any necessary adjustments to the programme in the light of these findings.
- Check operation of the system automatic dosing equipment and adjust, maintain as required.
- Carry out corrosion monitoring as necessary.
- Ensure that each site has sufficient chemical stock for at least one MONTH.

Complete individual System Log Sheets. Date, sign and print name. Ensure that any action required of them is carefully explained to site staff.

8.30 LEG 30 - Cooling Tower Chemical Water Treatment Control Parameters Specification

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 30
Task:	Cooling Tower Chemical Water Treatment Control Parameters Specification		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Please note that the details which follow are intended to be the minimum requirements that the Trust will accept.

Parameter	**Range**
pH	7.5 - 9.0
Suspended Solids	Slight
Conductivity / TDS	To suit Conc. Factor
Total Alkalinity	600 ppm maximum
Chloride	200 ppm maximum
Concentration Factor	3 - 6 Cycles
Other Chemical Parameters	To generally agree with above

8.31 LEG 31 - Cooling Tower Cleaning and Disinfection General Guidance

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 31
Task:	Cooling Tower Cleaning and Disinfection General Guidance		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

It is the aim of the Trust to comply with the recommendations of HSE document L8, which stipulates that all industrial cooling towers shall be cleaned and disinfected twice each year or as dictated by testing procedures.

In practice, this means that all the tower systems shall be shut for cleaning and disinfection twice each year **WHERE THIS IS POSSIBLE.**

However, if at any time the site has problems in shutting down cooling towers (and their associated plant) for any length of time and on line disinfection can be carried out.

8.32 LEG 32 - Cooling Tower Cleaning and Disinfection - For Cooling Towers That Can be Closed Down More Than One Working Day (Shut Down)

Nottingham University Hospitals NHS NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 32
Task:	Cooling Tower Cleaning and Disinfection - For Cooling Towers That Can be Closed Down More Than One Working Day (Shut Down)		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Circumstance of Use
If it is possible for the system/part system to be taken off line/isolated for a suitable period, then an off-line clean can be carried out.

Notice to Authorities
A minimum of one weeks' notice shall be given to any interested party with regard to tower emptying and discharge of chemicals.

Before Commencement
Disconnect all water treatment dosing equipment, and remove any slow release tablets from the system at least twelve hours before this operation commenced.

Pre-Chlorination
Add chlorine dosing to achieve 50mg/l free chlorine level in the circulation water. Hold this concentration for 30 minutes minimum. Drain the system, giving any required notice as above.

Manually clean all available surfaces of the tower and sump system. All COSHH precautions shall be observed. Spray disinfect any difficult areas and all natural materials. Pump out sump.

Chlorination
Refill the tower/system and on recirculation add sufficient chlorine dosing to achieve 50 ppm free chlorine minimum for a period of not less than three hours.

Neutralisation
When the chlorine level has been held for three hours, commence the addition of the recognised de-chlorination agent. Continue addition until the free chlorine level is less than 1 ppm. Log the time to achieve this.

Re-instate the chemical dosing and automatic blowdown.

The operation must be certificated to show the actual free chlorine and corresponding pH readings and the certification must be signed by the contractor and by site representative.

8.33 LEG 33 - Cooling Tower Cleaning and Disinfection - For Cooling Towers That Cannot be Closed Down More Than One Working Day (On-Line)

Nottingham University Hospitals NHS Trust			
Legionellosis Management And Control PPM Programme			
Process N^{o}:	N/A	Advice Note:	LEG 33
Task:	Cooling Tower Cleaning and Disinfection - For Cooling Towers That Cannot be Closed Down More Than One Working Day (On-Line)		
Frequency:	Pre-Planned Maintenance Programme - Task Frequencies		
If the Maintenance Staff or appointed contractor cannot, at any stage, comply with any part of this Specification, then an alternative Specification shall be agreed which, both; meets the requirements of current legislation and the needs of the Site.			

Part of this Specification requires packing and eliminators to be examined to establish if cleaning is actually required

This type of cleaning would be a major exercise employing a specialist to remove tower sides and external cladding in order to remove the tower packing for cleaning.

An inspection shall be conducted as soon as the towers are shut down each year. Dependent on the results of the inspection, the Responsible Persons Water must make budget allowances if cleaning is deemed necessary for the FOLLOWING year.

Circumstance of Use
If circumstances dictate that a system cannot be taken off line for the 6 monthly cleaning called for by L8, then this specification may be used.

Notice to Authorities
A minimum of one weeks' notice shall be given to any interested party with regard to tower emptying and discharge of chemicals.

Before Commencement
Disconnect all water treatment dosing equipment, and remove any slow release tablets from the system at least twelve hours before this operation commenced.

Increase the setting on the blowdown at that time and aim to achieve a concentration factor of not more than 1.2 for the start of the operation. Make sure that the increased make up is balanced and there is no danger of the system losing correct working level. Disconnect the Automatic blowdown during the Chlorination.

Chlorination
Run the tower with the fan off. If the nuisance value of the chlorine addition causes any concern, then abandon the operation and record this in the log.

Add the chlorine dosing to the system in the quantity recommended by the water treatment specialists. Do this gradually with the cooling tower fans and the system pumps still in use, the chlorine addition may cause a nuisance in the local area. Test for Chlorine and pH levels after 15 minutes, and again after 30 minutes.

If a level of 5 mg/l free chlorine is not evident, then increase the chlorine dosing addition gradually until this is attained. Record all chemical readings and product additions against the time.

If a level of free chlorine of 5 mg/l is not achieved after 45 minutes of gradual additions, then abandon the operation and record this and any readings and the timings in the log.

When the correct chlorine level is attained, run the system for 4 hours minimum, testing for chlorine and pH every 30 minutes and record these readings and any further addition of chlorine donor required to maintain the 5 mg/l concentration. Use bio dispersants during this operation to ensure maximum efficiency for the operation.

Neutralisation

When the chlorine level has been held for four hours, commence the addition of the recognised de-chlorination agent. Continue addition until the free chlorine level is less than 1 ppm. Log the time to achieve this.

Re-instate the chemical dosing and automatic blowdown.

The chlorination can now be certificated, but the text must state that this was an on-line disinfection.

9 ENGINEERING CONTINGENCY MEASURES - TEMPERATURES

9.1 Higher Than Recommended CWS Temperatures

Results Interpretation and Specific Action Required: The information below is meant to indicate some possible causes and suitable remedial action and shall not be considered exhaustive. Each failure must be considered in detail and the causes suitably addressed.

Result	Possible cause	Remedial Action
Mains >20°C	1. High ambient temperatures	• Consider on-line disinfectant to negate temperature control as primary bacterial control method. • Increase water through-put by strategic flushing to reduce water retention time. • Carry out biological (TVCC) sampling to ascertain effect of increased CWS temperatures. • When temperature exceeds 20°C persistently; increase frequency of biological sampling (TVCC) to MONTHLY to ascertain effect of increased CWS temperatures.
Tank temperature greater than Mains temperature	1. Tank over capacity	• Reduce stored water capacity to reduce water retention time. • Increase water through-put by strategic flushing to reduce water retention time. • Carry out biological sampling (TVCC) to ascertain effect of increased CWS temperatures.
	2. Lack of adequate tank insulation	• Install or improve tank insulation.
	3. High tank room temperatures	• Increase tank room ventilation.
Outlet temperatures greater than mains/tank temperatures	1. Areas of “low-flow” or dead-legs in the system and lack of adequate use causing stagnation	• Increase water through-put by strategic flushing to reduce water retention time. • Carry out biological sampling (TVCC) to ascertain effect of increased CWS temperatures.
	2. Lack of adequate insulation	• Install or improve tank and/or pipework insulation.
	3. Heating pipes in close proximity to CWS pipes	• Increase insulation • Consider relocation of CWS/heating pipes if practicable. • Consider on-line disinfectant to negate temperature control as primary bacterial control method. • Carry out biological sampling (TVCC) to ascertain effect of increased CWS temperatures.

NOTE: Ensure that all temperature measuring instruments including: thermometers; gauges and BMS Temperature monitoring points are adequately calibrated.

9.2 Lower Than Recommended HWS Temperatures

Results Interpretation and Specific Action Required: The information below is meant to indicate some possible causes and suitable remedial action and shall not be considered exhaustive. Each failure must be considered in detail and the causes suitably addressed.

Result	Possible cause	Remedial Action
Stored and/or Flow temperatures <60°C	1. Low "Set" temperatures for hot water generation of <60°C	• Increase temperature to ≥60°C. • If temperature <50°C, carry-out pasteurisation of vessel. • Carry out biological sampling (TVCC) to ascertain effect of decreased HWS temperatures.
	2. Thermostat failure	• Replace thermostat. • Carry-out pasteurisation of vessel before use. • Carry out biological sampling (TVCC) to ascertain effect of decreased HWS temperatures.
	3. Primary heating supply isolated	• Employ heating supply. • Carry-out pasteurisation of vessel before use. • Carry out biological sampling (TVCC) to ascertain effect of decreased HWS temperatures.
	4. Primary heating failure	• Repair primary heating supply. • Carry-out pasteurisation of vessel before use. • Carry out biological sampling (TVCC) to ascertain effect of decreased HWS temperatures.
	5. Generation units under-rating/under capacity	• Consider capacity vs demand and replace unit with more suitably sized vessel. • Carry-out pasteurisation of replacement vessel prior to being put into service.
	6. Temperature taken with contact probe	• Obtain 'direct' temperature, using calibrated thermometer, from ideally located sampling point and reconsider results.
	7. Gauges and/or BMS temperature monitoring points not calibrated	• Calibrate all gauges and/or BMS monitoring points and reconsider results.
Return temperature <55°C when Flow temperature >60°C	1. Distribution system short circuiting	• Carry out investigation of distribution pipe-work to locate possible short-circuit.
	2. Circulation pump under rated	• Upgrade circulation pump to a suitable rating. • Carry out biological sampling (TVCC) to ascertain effect of decreased HWS temperatures.
	3. Circulation pump faulty	• Replace/repair circulation pump.
	4. Temperature measurement taken down stream of cold supply	• Re-measure temperature from location upstream of cold supply.
	5. Temperature taken with contact probe	• Obtain 'direct' temperature, using calibrated thermometer, from ideally

		located sampling point and reconsider results.
	6. Gauges and/or BMS temperature monitoring points not calibrated	• Calibrate all gauges and/or BMS monitoring points and reconsider results.
Distribution temperatures <50°C when Flow temperature >60°C	1. Excessive heat loss.	• Inspect HWS and CWS insulation and upgrade where practicable. • Carry out biological sampling (TVCC) to ascertain effect of decreased HWS temperatures.
	2. "non-returned" pipe spurs	• Inspect the length of non-returned spurs and rectify by relocating HWS Return to within 300mm of point of delivery if practicable.
	3. Areas of "low-flow" or dead-legs in the system	• Increase water through-put by strategic flushing to reduce water retention time. • Carry out biological sampling (TVCC) to ascertain effect of decreased HWS temperatures.
	4. Presence of space-heating apparatus on the HWS system	• Investigate the presence of heat loss due the presence of space heating (towel rails, linen cupboard heaters, etc.) and remove from the system. • Carry out biological sampling (TVCC) to ascertain effect of decreased HWS temperatures.
	5. Failure of Trace Heating system or Trace Heating system not extending to extremities of the system.	• Inspect the Trace heating system and repair/replace if necessary or extend system to allow for temperature maintenance to system spurs. • Carry out biological sampling (TVCC) to ascertain effect of decreased HWS temperatures.

9.3 Cooling Tower Control Parameters Out of Specification

Results Interpretation and Specific Action Required: The information below is meant to indicate some possible causes and suitable remedial action and shall not be considered exhaustive. Each failure must be considered in detail and the causes suitably addressed.

Result	Possible cause	Remedial Action
High TDS	Increased Risk of: Scale Corrosion Bio-fouling General deposition	Check bleed Check chemical dosing Check make-up Refer to Water Treatment Company if situation continues
Low TDS	Waste of chemicals and water Increased risk of: Corrosion Bio-fouling	Check bleed Dose chemicals to restore specified levels
High chemical reserves	Waste of chemicals Potential for deposits Mutual inhibition of chemical activities Increased risk of: Corrosion	Check concentration factor Check dosage equipment Reduce chemical dosage if appropriate
Low chemical reserves	Increased risk of: Scale Corrosion Bio-fouling	Check bleed Check dosage equipment Check chemical drums Increase chemical dosage if appropriate
Negative hardness balance	Increased risk of: Scale deposition Nutrient presence	Check concentration factor Check chemical reserves Check dosage equipment Contact Water Treatment Trust if situation continues
High dip-slide count	Risk of bacterial contamination (may include Legionella)	Check levels of biocide Re-dose biocide if appropriate Retest dip-slide count Contact Water Treatment Company if situation continues
Presence of slime and algae	Increased risk of: Bacterial contamination (may include Legionella) Blockage of equipment	.Check levels of biocide Re-dose biocide if appropriate Clean tower to remove deposits Contact Water Treatment Company if situation continues
Presence of scale and sludge	Increased risk of: Nutrients Bacterial contamination (may include Legionella) Blockage of equipment Erosion Poor heat transfer	Check concentration factor Check chemical dosage Carry out dip-slide sample Clean tower to remove deposits Contact Water Treatment Company if situation continues

9.4 Result Interpretations and Appropriate Actions - Domestic Water Systems

9.4.1 A - Pre-flush analysis results in the absence of post-flush analysis contamination

Sample Taken		Result Interpretation	Action Required (Initial Sample) (To be carried out by incumbent Water Hygiene Contractor with the assistance of the Legionella Consultant)	Action Required (Re-Sample) (To be carried out by incumbent Water Hygiene Contractor with the assistance of the Legionella Consultant)			
Pre-Flush	Post-Flush						
Low	Low	No contamination detected in sample	No Action Required	Not Applicable			
Moderate	Low	Contamination probably localised only	Flush outlet thoroughly	Not Applicable			
Significant	Low	Contamination probably localised only	Chemically clean outlet. Flush outlet thoroughly and re-sample	Low	Moderate	Significant	High
				No Further Action Required		Take outlet out of use immediately. Chemically clean, disinfect and replace outlet. Flush outlet thoroughly and re-sample. Investigate local installation and fittings and search for dead-legs, non WRAS approved materials. Repeat Process. If continued use of outlet is required, consider the installation of a Point-of-Use (POU) filter until Negative or Insignificant results obtained	

9.4.2 B - Post-flush analysis results in the absence of pre-flush analysis contamination

<table>
<tr><th colspan="2">Sample Taken</th><th rowspan="2">Result Interpretation</th><th rowspan="2">Action Required
<u>(Initial Sample)</u>
(To be carried out by incumbent Water Hygiene Contractor with the assistance of the Legionella Consultant)</th><th colspan="4" rowspan="2">Action Required
<u>(Re-Sample)</u>
(To be carried out by incumbent Water Hygiene Contractor with the assistance of the Legionella Consultant)</th></tr>
<tr><th>Pre-Flush</th><th>Post-Flush</th></tr>
<tr><td>Low</td><td>Moderate</td><td>Contamination probably systemic</td><td>Flush outlet and system thoroughly.</td><td colspan="4">Not Applicable</td></tr>
<tr><td rowspan="2">Low</td><td rowspan="2">Significant</td><td rowspan="2">Contamination probably systemic</td><td rowspan="2">Flush outlet and system thoroughly and re-sample.

In addition to TVCC, collect Legionella sample.</td><td>Low</td><td>Moderate</td><td>Significant</td><td>High</td></tr>
<tr><td colspan="2" rowspan="2">No Further Action Required</td><td colspan="2" rowspan="2">Take system out of use immediately. Instigate system disinfection and re-sample (not earlier than 48hrs following disinfection).
In addition to TVCC, collect Legionella sample.

Investigate local installation and distribution system and fittings and search for dead-legs, non WRAS approved materials.

Repeat Process.

If continued use of outlet is required, consider the installation of a Point-of-Use (POU) filter until Negative or Insignificant results obtained.</td></tr>
<tr><td>Low</td><td>High</td><td>Contamination probably systemic</td><td>Take system out of use immediately. Instigate system decontamination and re-sample.

In addition to TVCC, collect Legionella sample.</td></tr>
</table>

9.4.3 C - Post-flush analysis results in the presence of pre-flush analysis contamination

<table>
<tr><th colspan="2">Sample Taken</th><th rowspan="2">Result Interpretation</th><th rowspan="2">Action Required
<u>(Initial Sample)</u>
(To be carried out by incumbent Water Hygiene Contractor with the assistance of the Legionella Consultant)</th><th colspan="4" rowspan="2">Action Required
<u>(Re-Sample)</u>
(To be carried out by incumbent Water Hygiene Contractor with the assistance of the Legionella Consultant)</th></tr>
<tr><th>Pre-Flush</th><th>Post-Flush</th></tr>
<tr><td>Moderate</td><td>Moderate</td><td>Contamination probably systemic with likely localised contamination</td><td>Flush outlet thoroughly.</td><td colspan="4">Not Applicable</td></tr>
<tr><td rowspan="2">Significant</td><td rowspan="2">Significant</td><td rowspan="2">Contamination probably systemic with likely localised contamination</td><td rowspan="2">Flush outlet and system thoroughly and re-sample.

In addition to TVCC, collect Legionella sample.</td><td>Low</td><td>Moderate</td><td>Significant</td><td>High</td></tr>
<tr><td colspan="2" rowspan="2">No Further Action Required</td><td colspan="2" rowspan="2">Take system out of use immediately. Chemically clean, disinfect and replace outlet. Instigate system disinfection and re-sample
(not earlier than 48hrs following disinfection).

In addition to TVCC, collect Legionella sample.

Investigate local installation and distribution system and fittings and search for dead-legs, non WRAS approved materials.

Repeat Process.

If continued use of outlet is required, consider the installation of a Point-of-Use (POU) filter until Negative or Insignificant results obtained.</td></tr>
<tr><td>High</td><td>High</td><td>Contamination probably systemic with likely localised contamination</td><td>Take system out of use immediately. Chemically clean outlet. Instigate system decontamination and re-sample.</td></tr>
</table>

9.5 Biological Analysis Results Interpretation Key - Domestic Water Systems

Analysis Sample	Reported Results		Result Interpretation
Aerobic count TVCC (22°C or 37°C)	None Detected		Low
	22°C	>10^1cfu/ml - <30^3cfu/ml	Moderate
	37°C	>10^1cfu/ml - <30^2cfu/ml	
	22°C	>30^3cfu/ml - <10^4cfu/ml	Significant
	37°C	>30^2cfu/ml - <10^4cfu/ml	
	22°C	>10^4 cfu/ml	High
	37°C		
Legionella spp.		None Detected	Low
		<10^2cfu/l	Moderate
		>10^2cfu/l - <10^4cfu/l	Significant
		>10^4 cfu/l	High
Coliforms, *E. coli and Pseudomonas spp.*		None Detected	Low
		<1cfu/100ml	Low
		>1cfu/100ml	High

9.6 Results Interpretations and Appropriate Actions - Cooling Water Systems

Sample Taken		**Action Required (To be carried out by incumbent Water Hygiene Contractor with the assistance of the Legionella Consultant)**
Aerobic count (TVCC & Dip-slides) cfu/ml at 30°C (minimum 48 hours incubation)	**Legionella bacteria cfu/litre**	
None detected	**None detected**	File sample results in site Logbook
10 000 or less	**100 or less**	System under control
More than 10 000 and up to 100 000	**More than 100 and up to 1000**	Review programme operation – A review of the control measures and risk assessment shall be carried out to identify any remedial actions and the count shall be confirmed by immediate re-sampling.
More than 100 000	**More than 1000**	Implement corrective action – The system shall immediately be re-sampled. It shall then be 'shot dosed' with an appropriate biocide, as a precaution. The risk assessment and control measures shall be reviewed to identify remedial actions.

10 RECORD KEEPING - DATA COLLECTION AND MANAGEMENT

The Trust uses a combination of a log book and virtual system (Zetasafe). The Zetasafe instruction manuals and processes are found in their own documentation which is held with the Estates and Facilities Management Department.

Routine PPM inspections shall be recorded directly onto the virtual system via hand held personal digital assistants (PDA's).

A range of information shall be stored in a hardcopy log book and this includes:

- Cleaning and Chlorination Certificates;
- Evidence of specific alterations and repairs;
- Risk Assessments;
- Drawings;
- Actions.

The virtual system will automatically generate faults from the data entered. These faults will be reviewed and actioned through regular interrogation of the system by the Responsible Person (Water), Deputy Responsible Person (Water) and the nominated engineering officers.

Issues identified from returned flushing sheets or reported via the Estates Job Logging System shall be actioned and a copy of the job ticket and notes of remedial actions filed in the appropriate hard copy log book.

11 ON-GOING COMPLIANCE PERFORMANCE MONITORING AND AUDIT

The Responsible Person Water shall have Overall Responsibility for Auditing the Legionellosis Management & Control Programmes across the Trust, and reporting all findings to the Legionella Steering Committee.

The Responsible Person Water shall carry-out, via a suitable qualified Independent Consultant, a detailed Quarterly audit to assess the compliance of the Legionellosis Management & Control and Safe Hot Water Management Programme implemented in buildings under their control with ACoP L8 and all relevant HTMs and in particular the status of the Risk Assessment Schedules, the Management Structures and Control procedures.

The Responsible Person Water shall receive from each site Responsible Person Water a Monthly Status Report describing the status of the Legionellosis Management & Control Programme, under their jurisdiction.

12 THE COURSE OF ACTION IF AN OUTBREAK OF LEGIONNAIRES' DISEASE IS SUSPECTED AND MAJOR OUTBREAK PLAN

The Estates Operations Team will usually be informed of a suspected outbreak of Legionnaires Disease by a member of the Trust Infection Control Committee. If an outbreak is suspected, then this Committee will normally work in association with the Public Health Laboratory and the local Medical Officer for Environmental Health to search for the source of the causative organism. This search is a specialist task which involves epidemiological studies and taking water samples for analysis.

The Health and Safety Executive may be involved in the investigation of outbreaks under the Health and Safety at Work Act 1974. Local authority environmental health officers may also be involved.

It is essential that the Trust engineers **do not** drain or disinfect the systems before samples have been taken. The Engineers role is an important one - guiding specialists to the various water systems within the building, and, in particular, to the points from which samples can be taken. Easy access to these sampling points is essential.

An investigation would concentrate upon all potential sources of Legionella infection including:

- the domestic hot and cold water system distribution;
- showers or spray washing equipment;
- drainage systems and taps;
- whirlpool baths or therapy pools;
- humidifiers in ventilation systems;
- cooling coils in air conditioning systems;
- fountains and sprinklers;

To assist in such investigations the Trust engineers will need to be able to provide details of all associated equipment, its location, technical data, the operating, maintenance and spares information on all the above installations. They must assist by advising the investigating team as to the extent of servicing on the site and locating taps and sample points.

Off-site information will also be required such as whether there has been any local excavation or earth moving works; alterations to water supply systems or drainage systems or any other factors which may have a bearing on the site.

The Infection Control Committee is responsible for identifying the cause of infection and will advise on cleaning, disinfection, any engineering modifications and long-term control measures.

13 MAJOR OUTBREAK PLAN

Please refer to the 'Guidance on the Control and Prevention of Legionnaires' Disease in England Technical Paper 1 - Disease Surveillance Date of Issue: August 2010 Document code: LegDisTP1 Version: 01.00

13.1 Introduction

This plan is largely based on the general Trust Outbreak Control Plan, with a few minor alterations to emphasise issues particularly pertinent to the control of legionella.

Legionella species occur naturally in the environment and are particularly associated with water sources. Outbreaks of human disease can be associated with a particular water source, which on occasions has proved to be a health care establishment.

Acute hospitals may be affected by any outbreak, whatever the source, as if large numbers of cases needing admission are involved, the normal running of the hospital may be affected. The Trust microbiology laboratory may also be required to process large numbers of diagnostic or environmental samples.

However, this plan is limited to the actions that shall be taken if the source of the outbreak is thought to be one of the hospitals within the Trust.

13.2 Definition of an Outbreak

"A legionella outbreak is defined by the Health Protection Agency (formerly the Public Health Laboratory Service) as two or more confirmed cases of legionellosis occurring in the same locality within a six month period. Location is defined in terms of the geographical proximity of the cases and requires a degree of judgement. It is the responsibility of the Proper Officer for the declaration of an outbreak. The Proper Officer is appointed by the local authority under public health legislation and is usually a Consultant in Communicable Disease Control (CCDC)."

13.3 Detection of an Outbreak

An outbreak may be detected by a variety of routes and personnel. Clinical, Infection Control, Microbiology and Public Health staff shall always consider the possibility of an outbreak when dealing with any case of definite or suspected legionella infection.

Any person, whatever their profession, shall contact the local Infection Control Team immediately, if they suspect that an outbreak of legionella infection may be occurring within the Trust. A member of the Infection Control Team is available 24 hours a day and can be contacted via the hospital switchboard.

The Infection Control Team will investigate the situation and the Infection Control Doctor responsible for the site(s) affected will decide whether to instigate the 'Outbreak Control Plan – Legionella'. Discussions with the relevant members of the Legionella and Water Quality Steering Group will form part of this early fact finding activity.

It shall be noted that when determining whether an outbreak of legionella infection is occurring, cases may not be confined to patients but may also occur in visitors and staff.

13.4 Outbreak Control Plan

The main objectives of the Outbreak Control Plan are as follows:

- To identify and define at the earliest stage if a legionella outbreak has occurred and if this is associated with the Trust premises.

- To organise satisfactory communication with appropriate internal and external agencies, patients and relatives.
- To identify the source of the infection.
- To stop further spread and prevent its recurrence.

The responsibility for co-ordinating the above objectives, lies with the 'Outbreak Control Team-Legionella'

13.5 Outbreak Control Team - Legionella

The Trust is a large organisation on several different sites. A legionella outbreak may affect one or more sites. The relevant personnel for each site affected shall be included in the Outbreak Control Team. Some of the roles detailed below will be filled by the same person e.g. the Infection Control Doctor may also be the microbiologist on the Legionella and Water Quality Steering Group.

The Outbreak Control Team must be called together rapidly and will comprise:

- Infection Control Doctor(s) – responsible for the site(s) affected
- Consultant Microbiologist(s) - responsible for the diagnostic microbiology laboratory service for the site(s) affected
- Infection Control Nurse(s) - responsible for the site(s) affected
- Legionella Steering Group members
- Director of Infection Prevention and Control or nominated Deputy
- Medical Director
- Nursing Director
- Medical, Nursing and Managerial staff from the site(s) affected
- Occupational Health Doctor/Nurse
- Responsible Person Water
- Hospital Engineer(s)
- Quality Risk and Safety Managers
- Health and Safety Advisor
- Infectious Disease physician
- Environmental Health Officer

Additional members may be invited to attend the outbreak meeting and may include:

- Senior Bed Manager
- Medical records manager
- Nominations from the Communicable Disease Surveillance Centre or the Division of Hospital Infection, Central Health Protection Agency Laboratory
- Consultant from the local Health Protection Agency Laboratory
- Regional Epidemiologist
- Public Relations Officer

Secretarial and clerical support must be made available to the Team and regular reports distributed to all Team members.

13.6 Procedure for Outbreak Control Team Meetings

The first Outbreak Control Team meeting will be co-ordinated by the Infection Control Doctor for the site(s) affected.

The terms of reference of the Team are:

- To investigate the source and cause of the outbreak
- To implement measures necessary to control the outbreak
- To monitor the effectiveness of the control measures
- To provide clear guidelines for communication with patients, patients' relatives, media, staff, other health authority services within and outside the Hospital.

Particular topics that shall be considered by the Team are:

- Detection of the source and implementation of any remedial measures required
- Case definition and detection of cases
- Diagnostic procedures and the effect on the microbiology laboratory
- Treatment of cases and any change in local empirical prescribing policy
- Effect on the normal running of the hospital
- Managing communication with patients, staff, public and the media
- Funding of the above activities
- Defining the end of the outbreak
- Future monitoring and control measures

The Infection Control Doctor – responsible for the site(s) affected will initially act as chairperson and outbreak co-ordinator. The Team shall decide at the first meeting the roles to be undertaken by each Team member. The chairperson and co-ordinator roles may be reassigned if the Team so wish.

Each member shall keep a daily record of his or her actions in respect of the outbreak and retain them in case the handling of the outbreak is reviewed/challenged at a later date.

It shall be noted that the Estates Operations Team plays a pivotal role in the detection of the source of the outbreak and implementing any remedial measures.

Subsequent meetings will systematically review the outbreak. The need to obtain further assistance shall be formally considered at each meeting. It shall be recognised that regional and national expert support is available for Legionella outbreaks and the Team shall make best use of this.

13.7 At The End of the Outbreak

After the outbreak is officially considered over, a final meeting of the Outbreak Team shall be held to:

- Review the action taken by all participants and to identify any areas for further improvements.
- Recommend if necessary changes which will reduce the chance of recurrence of the outbreak.

13.8 Interim and Final Reports

The Outbreak Control Team is responsible for providing any interim reports required by the hospital, and the final report at the conclusion of the outbreak, which must be signed by:

- Infection Control Doctor – responsible for the site(s) affected
- Responsible Person Water
- Consultant in Communicable Disease Control (CCDC)
- Director of Infection Prevention and Control or nominated Deputy

14 TRUST IMPACT ASSESSMENTS

14.1 Equality Impact Assessment

See Legionella Management & Control Policy (HS/EI/004) for relevant information (Section 11 Appendix A)

14.2 Environmental Impact Assessment

See Legionella Management & Control Policy (HS/EI/004) for **important** information (Section 12 Appendix B)

14.3 Here For You Assessment

See Legionella Management & Control Policy (HS/EI/004) for relevant information (Section 13 Appendix C)

15 POLICY PROCEDURE MATRIX DOCUMENT

See Legionella Management & Control Policy (HS/EI/004) for relevant information (Section 9)

16 RELEVANT LEGISLATION; NATIONAL GUIDANCE AND ASSOCIATED NUH DOCUMENTS

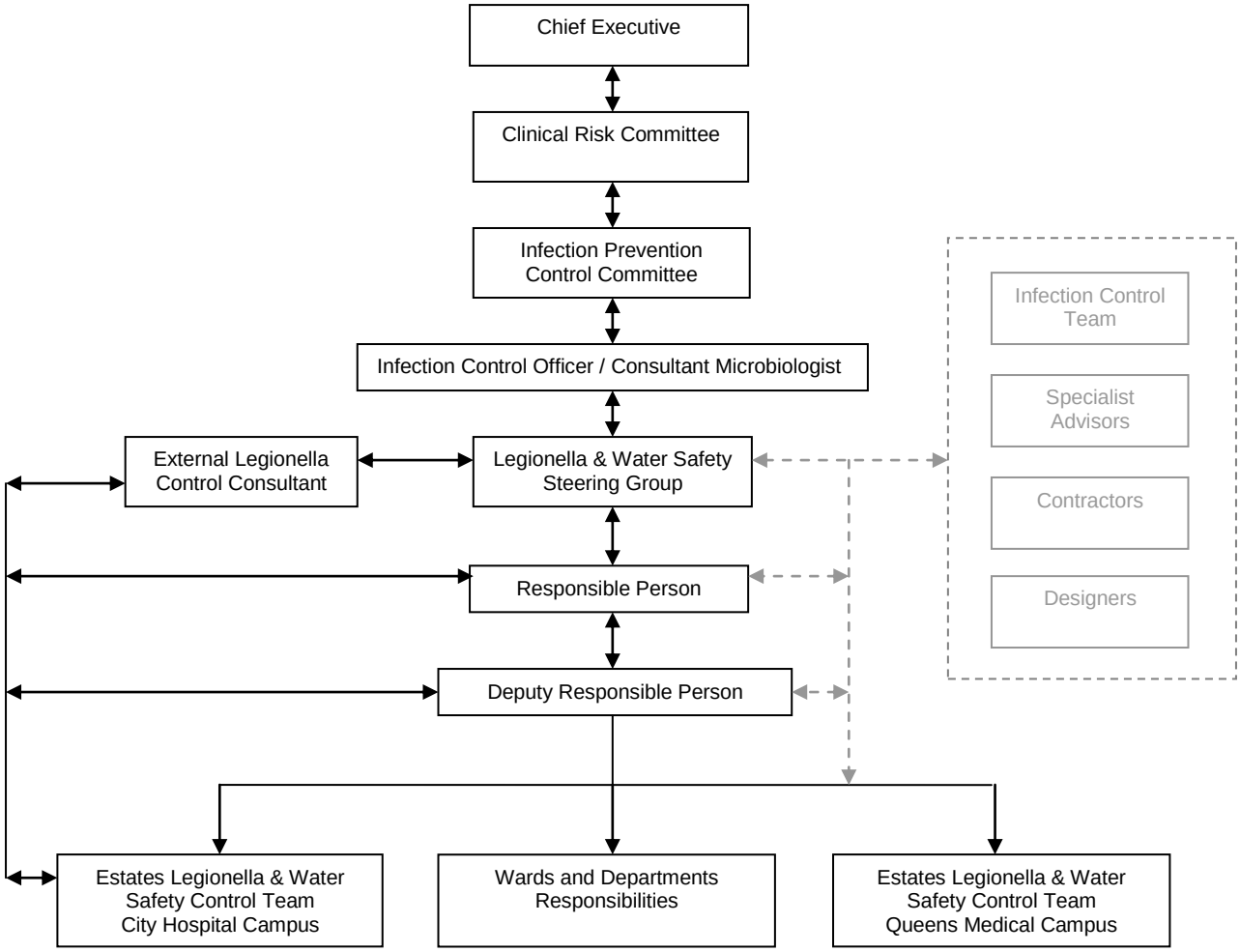
See Legionella Management & Control Policy (HS/EI/004) for relevant information (Section 10)

17 APPENDIX A – LIST OF AREAS TREATED WITH CHLORINE DIOXIDE / SODIUM HYPOCHLORITE

Chlorine Dioxide dosing is used on Ward E17 at the QMC Campus

Sodium Hypochlorite is used in the Pump Houses at the City Campus.

18 APPENDIX B – MANAGEMENT STRUCTURE FOR THE MANAGEMENT AND CONTROL OF LEGIONELLOSIS



19 APPENDIX C – CERTIFICATE OF CONFORMITY

19.1 Cold Water Storage Tank Cleaning and Disinfection

Nottingham University Hospitals NHS
NHS Trust

Legionellosis Management & Control Log-Book

Certificate of Conformity

Cold Water Storage Tank Cleaning and Disinfection

Using Chlorine Dioxide as the disinfecting agent (ClO_2) – Soaking method

No	Tasks	Date	Tank Asset No.	Comments	Signature
1	Tank Volume:				
2	Method of disinfection:				
3	Disinfectant used:				
4	Volume of disinfectant used:				
5	pH:				
6	Chlorine dioxide level (mg/L):				
7	Initial				
8	After 1 hour:				
9	Post disinfection				
10	Neutralising agent used:				
11	Amount of neutralising agent used:				
12	Water analysis carried out (Y/N):				
13	Analysis results				
14	Date of last disinfection:				
15	Any refurbishment, improvements carried out during this disinfection:				
16	Further upgrading, refurbishment, improvements works required				

This section to be completed by the person carrying out the certificate of conformity

Signature of Responsible Person		Date of check		**FORM No. 1**

All reported faults to be transferred to "Monthly Defect Log" for processing

19.2 Distribution Services Disinfection

Nottingham University Hospitals NHS
NHS Trust

Legionellosis Management & Control Log-Book

Certificate of Conformity

Distribution Services Disinfection

Using Chlorine Dioxide as the disinfecting agent (ClO_2)

No	Tasks	Date	System	Comments	Signature
1	System Volume:				
2	Method of disinfection:				
3	Disinfectant used:				
4	Volume of disinfectant used:				
5	pH:				
6	Initial disinfectant level (ClO2 mg/L):				
7	After 1 hour(ClO2 mg/L):				
8	Post disinfection (ClO2 mg/L):				
9	Neutralising agent used:				
10	Amount of neutralising agent used:				
11	Water analysis carried out (Y/N)				
12	Analysis results				
13	Date of last disinfection:				
14	Any refurbishment, improvements carried out during this disinfection:				
15	Further upgrading, refurbishment, improvements works required				

This section to be completed by the person carrying out the certificate of conformity

Signature of Responsible Person		Date of check		**FORM No. 2**

All reported faults to be transferred to "Monthly Defect Log" for processing

19.3 Calorifier Pasteurisation

Nottingham University Hospitals NHS
NHS Trust

Legionellosis Management & Control Log-Book

Certificate of Conformity

Calorifier Pasteurisation

No	Tasks	Date	Calorifier Asset No.	Comments	Signature
1	System Drain flush carried out:				
2	Inlet Valve closed:				
3	Outlet valve closed:				
4	Circulation pumps off:				
5	Shunt pump on:				
6	Are there any leaks (Y/N)				
7	Type of heating provided:				
8	Time of beginning of process (24hr clock):				
9	Pasteurising temperature achieved:				
10	Time pasteurising temperature kept:				
11	Time of end of process (24hr clock):				
12	Water analysis carried out (Y/N)				
13	Analysis results				
14	Date of last disinfection:				
15	Any refurbishment, improvements carried out during this disinfection:				

This section to be completed by the person carrying out the certificate of conformity

Signature of Responsible Person		Date of check		**FORM No. 3**

All reported faults to be transferred to "Monthly Defect Log" for processing

19.4 Daily Flushing Sheet

DAILY FLUSHING OF ALL WATER OUTLETS IN ROOMS / AREAS

Site: .....
Ward / Department: .....
Bar Code: .....
Week Commencing (Monday) ……../……../……..

Room No.	Barcode	Fitting	Outlet	Used Regularly?	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Requisition No.
					Flow	Temp	Flow	Temp	Flow	Temp	Flow	Temp	Flow	Temp	Flow	Temp	Flow	Temp	

Signed …….....…..…… Print ….....……..... (Ward Manager/Department Manager) Date……../……../……..

Guidance Notes: -

1. It is important to flush all water outlets daily
2. Run all outlets for a minimum of 2 minutes at full flow (except toilets and bidets which shall be flushed once). If the outlet is used every working day then please tick the appropriate column.
3. If outlet does not run cold or hot as appropriate or the flow rate is poor report to Directorate of Estates & Facilities Website and enter requisition number on the flushing sheet **(It is the responsibility of the user to report the fault!).** Please contact the Estates Department if is advice is required.

ESTATES USE ONLY

Seen By	Date
No Action	**See Report/Notes**

4.	The Ward/Departmental Flushing Record Sheet of all Water Outlets must be sent to **Estates and Facilities, Administration Section, Facilities Building, City Campus on a weekly basis** and a copy retained on the Ward/Department for inspection.		

Continuation Sheet

Ward / Department: .....

Room No.	Barcode	Fitting	Outlet	Used Regularly?	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Requisition No.
					Flow	Temp	Flow	Temp	Flow	Temp	Flow	Temp	Flow	Temp	Flow	Temp	Flow	Temp	

Signed …….....…..…… Print ….....……..... (Ward Manager/Department Manager) Date……../……../……..

20 APPENDIX D – CERTIFICATE OF EMPLOYEE AWARENESS

Document Title	Legionella Management and Control Procedures
Version (number)	2
Version (date)	8 May 2014

I hereby certify that I have:

- Identified (by reference to the document control sheet of the above policy/ procedure) the staff groups within my area of responsibility to whom this policy / procedure applies.
- Made arrangements to ensure that such members of staff have the opportunity to be aware of the existence of this document and have the means to access, read and understand it.

Signature	
Print name	
Date	
Directorate/ Department	

The manager completing this certification should retain it for audit and/or other purposes for a period of six years (even if subsequent versions of the document are implemented). The suggested level of certification is;

- Clinical directorates - General Manager
- Clinical directorates – Responsible person for completing the daily flushing sheet)
- Non clinical directorates - Deputy Director or equivalent.
- Non clinical directorates - Responsible person for completing the daily flushing sheet)
- Non clinical directorates – All Estate Staff responsible for undertaking legionella and water quality roles
- Non clinical directorates – All Capital Planning Project Managers (and the informing the Design Team)

The manager may, at their discretion, also require that subordinate levels of their directorate / department utilize this form in a similar way, but this would always be an additional (not replacement)