

# "WATER SAFETY PLAN"

Incorporating *Legionella* "safe" hot water, cold water, drinking water and ventilation systems Management and Control,

## BOOK 1

# GENERAL CONSIDERATIONS

This document was formally approved by The University Health and Safety Committee on:

Date 17<sup>th</sup> June 2016

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Signed

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## **i. DISTRIBUTION CONTROL**

This Water Safety Plan (WSP) has a controlled circulation and should not be copied or circulated without the permission of the Water Safety Group (WSG) Chair.

Confirmation that each Departmental Responsible Person and their Deputy have read and understood this WSP and recorded on each 'Letter of Nomination' enclosed in [Appendix 1](#). While the WSG have delegated responsibility to department leads and framework contractors to ensure that information contained herein is disseminated to all appropriate parties; including at induction via specific instruction to work to the WSP.

## ii. DOCUMENT MANAGEMENT

Whilst this document is developed in such a way as to ensure that all aspects of Water Quality Management are addressed, its construction is such as to allow for ease of use and it is thus divided into the following sections which can be considered in isolation:

Document No.	Document Title	Targeted Departments						
		FM Services		H&S	Schools & Sports	Contractors	Commercial	Imago & Campus Living
		Hard FM	Soft FM					
Book 1	General Considerations	✓	✓	✓	✓	✓	✓	✓
Book 2	FM Services Management	✓	✓	✓	✓	✓	✓	✓
Book 3	Projects & Capital Management	✓	✓	✓		✓		
Book 4	Contingency Measures	✓	✓	✓	✓		✓	✓

*NB – Hard FM Services are related to Building mechanical and electrical services. While Soft FM Services are related to but not limited to cleaning, catering, accommodation, security, landscaping, waste management.*

This WSP shall be used in conjunction with current version of the following University Policies:

### i. Domestic Services

<http://www.lboro.ac.uk/services/fm/services/domestic/>

### ii. General Sport Policy –

<http://www.lboro.ac.uk/departments/ssehs/research/social-sciences-and-sport/sport-policy-and-management/>

### iii. Catering equipment and Irrigation systems (Grounds and Gardening) –

<http://www.lboro.ac.uk/services/fm/services/grounds>

## 1. AIM

### 1.1 General:

It is the responsibility of any person employed by Loughborough University, known as the University in this document, in whatsoever capacity to comply with the requirements of this Plan.

The University, accepts its responsibility under the Health and Safety at Work etc. Act 1974 and the Control of Substances Hazardous to Health Regulation 2002 (as amended), to take all reasonable precautions to prevent or control the harmful effects of contaminated water to students, visitors, staff and other persons working at or using its premises and to ensure the provision of “safe” hot water, drinking water and ventilation systems.

This WSP provides the guidance, instruction, specification and infrastructure for the implementation of the University's Management & Control programme for: The control of Legionella, hygiene, 'safe' hot water, cold water and drinking water systems.

Management procedures shall seek to ensure that compliance with this WSP is continuing and not notional.

As part of the University's commitment to providing 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 services, and that comprehensive records will be maintained.

### 1.2 Written Scheme:

This WSP must be used to compile a Written Scheme. The written scheme should be specific and tailored to the systems covered by the risk assessments and shall include the following precautions:

- ensure the release of water spray is properly controlled;
- avoid conditions that support growth of microorganisms, including Legionella and Pseudomonas;
- ensure water cannot stagnate anywhere in the system by regular movement of water in all sections of the systems and by keeping pipe lengths as short as possible, and/or removing redundant pipework and deadlegs;
- avoid using materials that harbour bacteria and other microorganisms or provide nutrients for microbial growth (the *Water Fittings and Materials Directory*<sup>10</sup> lists fittings, materials, and appliances approved for use on the UK Water Supply System by the Water Regulations Advisory Scheme. Those approved are tested against BS 6920);<sup>11</sup>
- keep the system and the water in it clean;
- treat water to either control the growth of microorganisms, including Legionella, or limit their ability to grow;

- monitor any control measures applied;
- keep records of these and other actions taken, such as maintenance and repair work

The scheme should specify the various control measures, how to use and carry out those measures, describe the water treatment regimes and the correct operation of the water system. Along with the guidance in this WSP, details listed below are intended to summarise the information to include in the building/system-specific Legionella Written Scheme, i.e.:

- purpose;
- scope;
- risk assessment;
- management structure;;
- responsible person(s) and communication pathways;
- training;
- allocation of responsibilities, ie to the responsible persons and water treatment service provider;
- up-to-date schematic plan showing the layout of the system(s) and its location within and around the premises – this should identify piping routes, storage and header tanks, calorifiers and relevant items of plant, especially water softeners, filters, strainers, pumps and all water outlets;
- the correct and safe operation of the system;
- precautions in place to prevent or minimise risk associated with the system;
- analytical tests, including microbiological testing, other operational checks, inspections and calibrations to be carried out, their frequency and any resulting corrective actions;
- remedial action to be taken in the event that the scheme is shown not to be effective, including control scheme reviews and any modifications made;
- health and safety information, including details on storage, handling, use and disposal of any chemical used in both the treatment of the system and testing of the system water;
- incident plan, which covers the following situations: major plant failure, e.g. chemical system failure;
- very high levels or repeat positive water analyses for Legionella;
- an outbreak of legionellosis, suspected or confirmed as being centred at the site;
- an outbreak of legionellosis, the exact source of which has yet to be confirmed, but which is believed to be centred in an area which includes the site.

## 2. APPLICATION AND SCOPE

### 2.1 Extent of application:

This WSP applies to all premises whether owned or occupied by the University, lease or other Service Level Agreements (SLA) including:

- i. All premises owned and occupied exclusively by the University.
- ii. All premises owned and occupied partly by the University.
- iii. All premises not owned by the University but occupied exclusively by the University on a permanent basis.
- iv. All premises not owned by the University but occupied partly by the University on a permanent basis.
- v. All premises not owned by the University but occupied partly by the University on a temporary or periodic basis.

Where the management of premises/areas occupied by University staff and/or students is carried-out by others, the requirements of this Plan remain applicable although implementation of the site specific Risk Management requirements is managed by local Policies which are ratified by the University Risk Management Team and agreed by the WSG. It remains; therefore, the University's responsibility to ensure that the requirements of this Policy are notified to and complied with by all other parties described above. It is, therefore, the responsibility of any person employed by the University, in whatsoever capacity to comply with the requirements of this WSP.

This Water Safety Plan does not apply to the following premises:

- i. All premises owned by the University but occupied exclusively by others unless agreed under the SLA requiring the University to deliver to the occupier Water Quality Management in accordance with this WSP.

Details of all premises and their ownership and occupation status, is found in Appendix 2 of this Book.

Occupation of premises not owned by the University but occupied partly by the University on a permanent, temporary or periodic basis shall be authorised by the University's Consultant Microbiologist following receipt of completed pro-forma ([Permit No. 1 'Permit to Occupy Facility Owned by Others'](#)) found in [WSP Book 2 FM Management](#).

### 2.2 Scope:

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

- i. Domestic Cold Water Services – Storage and Distribution
- ii. Domestic Hot Water Services – Generation Storage and distribution
- iii. Faucets, showers, bib taps, etc.

- iv. Thermostatic Mixing Valves (TMV)/Thermostatic Mixing Taps (TMT)
- v. Drinking Fountains
- vi. Vending Machines
- vii. Irrigation Systems
- viii. Fire fighting Systems
- ix. Emergency Showers/ Eye Washers
- x. Wet Air Conditioning
- xi. Adiabatic coolers
- xii. Portable humidifiers
- xiii. Portable Air Conditioning Units
- xiv. Ground/Floor wash vehicles
- xv. Other systems considered to pose a risk

### 2.3 Limitations of this WSP:

The document does not provide specific guidance for management of water quality for specialist water systems used at University sites. This includes facilities – such as Irrigation Systems, Rainwater Harvesting, Water Features, Swimming Pools, plunge pools, hot tubs and Lathes / Cutters which have their own stringent procedures and standards in place via the area / department managers.

Academic and Lab area equipment are maintained via the Schools and Academic leads with “local” policies and compliance contracts in place. FM maintenance provide services to point of use then department look after specific items while H&S guidance and pool safety and water treatment are expected as adhered to.

### 3. MICROBIOLOGICAL CONTROL METHODS

#### 3.1 General Considerations:

Management of water systems and associated end-of-line fittings to reduce the risk of microbial growth including opportunistic pathogens such as *Legionella sp.* is vital to user safety. It requires on-going maintenance and surveillance of control measures employed.

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

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

#### 3.2 Temperature:

The University shall employ 'Temperature Control' as the primary method of Legionella control within the domestic water systems. This is achieved by maintaining temperatures of:

- i. Cold water at temperatures of  $< 20^{\circ}\text{C}$
- ii. Cold Water Services (CWS) Distribution at  $< 20^{\circ}\text{C}$
- iii. Stored hot water at  $\geq 60^{\circ}\text{C}$
- iv. Hot Water Services (HWS) Flow at  $\geq 60^{\circ}\text{C}$
- v. HWS Distribution at all outlets at  $\geq 50^{\circ}\text{C}$  HWS Return at  $\geq 50^{\circ}\text{C}$

**Note 1** – The installation of trace heating as a control measure shall only be considered as a last resort should alternative rectification works not prove successful.

**Note 2** – For “Clinical Areas” located and in operation within / or on University sites the following shall be adhered to:

- vi. Cold water at temperatures of  $< 20^{\circ}\text{C}$
- vii. Cold Water Services (CWS) Distribution at  $< 20^{\circ}\text{C}$
- viii. Stored hot water at  $\geq 60^{\circ}\text{C}$
- ix. Hot Water Services (HWS) Flow at  $\geq 60^{\circ}\text{C}$

- x. HWS Distribution at all outlets at  $\geq 55^{\circ}\text{C}$
- xi. HWS Return at  $\geq 55^{\circ}\text{C}$

For any area providing this service it shall be ensured that British Standards and Health Technical Memorandums shall be adhered to and maintained to ensure compliance within these areas.

**Guidance Note 2:**  $55^{\circ}\text{C}$  is the normally acceptable return temperature for systems in **patient areas** and so far as reasonably practicable and following assessment of risk and system design/capabilities. In non-patient areas, the return temperature shall be a minimum of  $55^{\circ}\text{C}$ . In order to ensure maximum efficiency of the control method, it is important to keep all systems clean and well used at all times and at the correct temperatures

### 3.3.1 Chlorine dioxide (ClO<sub>2</sub>):

In addition to Temperature Control, the University shall utilise on-line dosing of the oxidising biocide Chlorine dioxide (ClO<sub>2</sub>) for Legionella control. This shall be achieved by proportionally injecting the biocide into various parts of the system and maintaining levels of ClO<sub>2</sub> at:

- a. Point of injection – between 0.25 and 0.8ppm (Note: 0.8ppm must be considered as the maximum allowed level at point of injection and it is only allowed at this level at this point in order to allow for the minimum levels to be achieved at the point of delivery). Any level fluctuations must only be tolerated within this range and care must be exercised to ensure that the level of ClO<sub>2</sub> at the nearest outlet does not exceed 0.5ppm.
- b. Point of delivery (measured at sentinel outlets) – between 0.25 and 0.5ppm

ClO<sub>2</sub> is an oxidising biocide/disinfectant that when used correctly, has been shown to be effective at controlling both Legionella and biofilm growth in hot and cold water systems. In the appropriate application, it may be used to aid Legionella control where maintaining a conventional temperature regime is difficult or where the removal of all dead legs and little used outlets is impractical. ClO<sub>2</sub> is usually produced on site from a chlorite-based precursor using a ClO<sub>2</sub> generator or dosing system by reaction with one or more other chemical precursors or by a catalytic oxidation process.

### 3.3.2 Calcium Hypochlorite solid chemical systems (M101)

In addition to Temperature Control, the University shall utilise on-line dosing of the Calcium Hypochlorite Ca(OCl)<sub>2</sub> solid chemical system for Legionella control. This shall be achieved by proportionally injecting the biocide into various parts of the system and maintaining levels of free chlorine at:

- c. Point of injection – between 0.6 and 1ppm at dissolver tank. Any level fluctuations must only be tolerated within this range and care must be exercised to ensure that the level of M101 at the nearest outlet does not exceed 1ppm.
- d. Point of delivery (measured at sentinel outlets) – between a minimum of 0.33 and 0.8ppm

Ca(OCl)<sub>2</sub> is an oxidising biocide/disinfectant that has been shown to be effective at controlling both Legionella and biofilm growth in hot and cold water systems. Based on proven technology, the **MICROCHEM M101** active ingredients are set out in the DWI Approved Products List. **MICROCHEM M101** is a chlorine biocide for secondary disinfection of hot and cold water services and potable applications and is an alternative to the other water treatment systems available at LU and is a DWI approved product for constant use in potable water systems. The system should be operated as per the manufacturer's guidelines and target levels as set out in this WSP.

#### 3.4 Efficacy Considerations:

In order to ensure maximum efficiency of all the control methods described above, all systems shall be kept clean and adequately used at all times and the correct temperatures and chemical parameters achieved.

The University's management will continue to consider new developments and improvements in the field of Water Quality Management & Control, in order to ensure that the control of the prevailing risks, posed by the systems and operations on its sites, is constantly reviewed and improved and always maintained at the maximum level.

Where practicable, the University shall ensure that accurate records and drawings are available, which cover all the hot and cold-water systems. Wherever practicable, such drawings shall be accurately maintained and updated following any modification. The University shall ensure that priority is given to all augmented care and designated high-risk areas.

All services shall be properly labelled such that the individual services can be easily identified.

Staff who are engaged in the installation, removal and replacement of outlets and associated pipework and fittings shall be suitably trained to prevent contamination of the outlet and water system.

#### 3.5 Shot-dosing (Hyper-chlorination):

During specific circumstances, when either methods of bacterial control is shown, by the various PPM Programme Monitoring Tasks, to be failing, the water quality shall be recovered and maintained by the use of shot-dosing of a suitable disinfecting agent, the levels of which must be maintained within the recommended limits for achieving disinfection as specified within the current edition of BS8558:2015: Clause 5.2.3 Flushing and Disinfection and L8 – The Control of Legionella bacteria in water systems – Approved Code of Practice & Guidance 2013.

**Guidance Note 4:** Sodium hypochlorite will normally be used as the hyper-chlorination disinfectant agent throughout. Where alternative disinfection agents are intended for use, a written proposal outlining the reasons why an alternative disinfection agent is proposed for use, the proposed disinfection agent, COSHH sheets, risk assessment and methodology shall be presented to the FM Department Responsible Person for written authorisation. Alternative disinfection agents shall not be used without prior written consent from the FM Department Responsible Person.

### 3.6 Infrequently used outlets:

The risk from water borne bacteria growing and proliferating in peripheral parts of the domestic water system, such as infrequently used outlets and dead legs off the re-circulating hot water system, may be minimised by regular use of these outlets. When outlets are not in regular use, regular and frequent flushing of these devices for several minutes can significantly reduce the risk of water borne bacteria proliferation in the system. Once started, this procedure has to be sustained and logged, as lapses can result in a critical increase in water borne bacteria at the outlet. Where there are high-risk users more frequent flushing may be required as indicated by the risk assessment.

The University shall ensure that:

- i. All outlets assessed and deemed to be 'disused' shall be considered for removal from the system ensuring that their removal does not create dead-legs.
- ii. When assessed and deemed "infrequently/inadequately used", all taps shall be flushed at least Weekly (2 x Weekly or more frequently if deemed necessary) for a minimum of two minutes.
- iii. If the outlet is fitted with a Point Of Use (POU) filter, the filter shall not be removed in order to flush the tap unless the manufacturer's instructions advise otherwise. A record shall be kept of when they were flushed.
- xii. Where practicable, taps which are programmed to flush automatically shall be monitored and the automatic flushing information shall be recorded on the building management system.
- xiii. During non-term periods the usage of outlets / areas shall be evaluated and via the COMPASS module departments shall be informed of additional flushing requirements.

### 3.7 Bacterial Contamination Monitoring – Water bacterial analysis sampling:

The microbiological control measures shall be supported by a robust, routine and ad-hoc, water bacterial analysis sampling process, designed to suit the prevailing status of all Water Quality Management control parameters and user care. Sample locations and sampling frequency shall be selected by the WSG, with support from the Health and Safety Team, and instructed to the FM department, who will arrange for the collection of samples. Microbiological samples shall be collected under the following circumstances:

- i. In all designated High risk (Legionella) areas
- ii. As required by WSG.
- iii. As a measurement of water quality of the incoming Mains supply.
- iv. As a measurement of the efficacy of the ClO<sub>2</sub> or M101 system.
- v. When the Pre Planned Maintenance (PPM) Programme indicates failure of control parameters.
- vi. When HWS and CWS outlet temperatures are outside the recommended temperature limits for 2 No consecutive monitoring visits (PPM or remedial).
- vii. Re-sampling following positive biological results.
- viii. As part of pool management

- ix. As part of 'Building/Area Occupation' procedures.
- x. During a suspected outbreak.
- xi. During an outbreak (as instructed by the outbreak investigating officer).

Microbiological sampling shall be carried out in order to consider two distinct areas of water quality management & control:

- a. localised bacterial contamination;
- b. systemic bacterial contamination.

Localised contamination is detected by collecting and analysing a 'pre-flush' sample consisting of the untainted collection of a sample of the water present at the outlet achieved by running the tap without flushing or cleaning the tap and collecting the water dispensed.

Systemic contamination is detected by collecting and analysing a 'post-flush' sample consisting of the water collected following spraying the outlet with a disinfectant solution equivalent to 1% sodium hypochlorite, leaving disinfectant in contact with the tap for at least 2 minutes then flushing the outlet for another 2 minutes before collecting the sample.

These two types of samples are useful in determining the location of the contamination detected and in determining the appropriate remedial corrective action required to remove the identified bacterial contamination.

Microbiological Sampling must be carried out in accordance with the PHE "Examining food, water and environmental samples from healthcare environments – Microbiological Guidelines: April 2013" and BS 7592:2008 – Sampling for Legionella bacteria in water systems – Code of practice. In addition, samples must be collected by suitably qualified personnel and in accordance with UKAS ISO/IEC 17025 (for sample collection) or UKAS ISO/IEC17020 (as part of the risk assessment process).

Specific microbiological sampling shall be carried out in accordance with the agreed sample schedule detailed below:

TYPE OF SAMPLE	LOCATION AND FREQUENCY OF SAMPLE
TVCC	<ul style="list-style-type: none"> <li>i. As required following failure of control measures.</li> <li>ii. Annual TVC, E. Coli and Coliforms sampling in Kitchen areas as determined by listing from Contracts Manager.</li> <li>iii. Monthly from location with associated historical contamination issues at the University sites.</li> </ul> <p><i>Please Note:</i></p> <ul style="list-style-type: none"> <li>• <i>The sample locations list shall be developed by the FM department and agreed by H&amp;S.</i></li> <li>• <i>Pre and Post flush sample to be collected as described in <a href="#">Process No. 1 'Microbiological sample collection protocol.</a></i></li> </ul>

Legionella	<ul style="list-style-type: none"> <li>i. Monthly in Village area or any areas with biocide treatment as a measurement of system efficacy.</li> <li>ii. Quarterly in ALL clinical designated areas.</li> <li>iii. Following specific request by the FM, Capital or H&amp;S.</li> <li>iv. Following 'persistent' TVCC failures ('Persistent' confirmed at the discretion of H&amp;S).</li> <li>v. Changes to the system.</li> <li>vi. As part of the following processes: <ul style="list-style-type: none"> <li>1. <a href="#">Permit No. 1: Permit to occupy facility owned by others</a>;</li> <li>2. <a href="#">Permit No. 3: Permit for Release into Use of new installations of small sized pipework installation projects and associated components</a>;</li> <li>3. <a href="#">Permit No. 4: Notification of closure of facility and Permit to re-occupy</a>; and</li> <li>4. <a href="#">Permit No. 5: Permit for Hand-over and occupation of new builds</a>.</li> </ul> </li> <li>vii. Under contamination investigation procedures.</li> <li>viii. During an outbreak or suspected outbreak of Legionnaires' disease.</li> <li>ix. Under particular WSG requirements/instructions.</li> </ul> <p><i>Please Note:</i></p> <ul style="list-style-type: none"> <li>• <i>The sample locations list, type of sample and frequency of sampling shall be determined by the WSG.</i></li> <li>• <i>Pre and Post flush sample to be collected as described in <a href="#">Process No. 1 'Microbiological sample collection protocol'</a></i></li> </ul>
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### 3.8 Instrument Calibration:

Temperature, ClO<sub>2</sub> and M101 measurement equipment and water sampling equipment for carrying out monitoring works shall be calibrated on an annual basis and the certification of calibration appropriately provided and appropriately retained in the Critical Records System. Calibration service providers shall be accredited via UKAS calibration and accredited to ISO 17025.

### 3.9 Domestic Cleaning:

Crucial to the success of cleaning services is that the issues of personal responsibility and accountability are addressed. Key personnel shall have reflected in their objectives the deliverable outcomes for cleanliness to ensure that it is incorporated into the University's core business through performance frameworks and that they are held to account for their elements of it. The cleaning of clinical wash-hand basins and the taps shall be undertaken in a way that does not allow cross-contamination from a bacterial source to the tap and in accordance with the University's current Policy:

<http://www.lboro.ac.uk/services/fm/services/domestic/>

#### 4. SCALDING CONTROL METHODS

Scalding control in all University's premises whether owned or occupied by the University under lease or other Service Level Agreements (SLAs) shall be based on a suitable and sufficient risk assessment.

The temperature from all such outlets shall be measured on a regular basis (at a frequency determined by the current Pre Planned Maintenance Schedule –detailed in Section 6 of this document) and maintained at:

- i. 41°C (+/-1°C) for showers
- ii. 41°C (+/-1°C) for basins
- iii. 44°C (+/-1°C) for baths
- iv. 38°C (+/-1°C) for bidets

Scalding control in non full-body immersion shall be achieved by a combination of TMVs and TMTs (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.

TMVs/TMTs can be removed if fitted to such locations following risk assessment and specific derogation from the WSG. It is the University's policy, however, that TMVs/TMTs shall be removed, where practicable, and only following risk assessment confirmation that it is safe to do so. Removal of any TMVs/TMTs must only be carried out following written approval by the WMG.

TMVs/TMTs shall be maintained in the following manner:

- i. TMVs/TMTs and associated components shall be serviced regularly, including descale and decontamination.
- ii. TMTs with blending integral to the body of the tap/shower shall be considered instead of TMVs, as they always draw cold water through every time the outlet is used, thus helping to minimise the risk of stagnation.
- iii. Taps shall be removed for maintenance purposes and they shall be periodically removed for descaling and decontamination.

## 5. RISK ASSESSMENTS

### 5.1. Legionella:

A suitable and sufficient Legionella risk assessment compliant with UKAS ISO/IEC 17020:2012, BS8580:2010 and ACoP (L8) shall be carried out by the University's externally appointed specialist independent advisor on all buildings currently owned or occupied by the University, 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 shall be reviewed and/or updated when there are significant changes to statutory standards, operational requirements and when there are significant changes to a building's domestic water and wet air systems.

Risk assessments must also be carried out on all process and equipment, such as specialist equipment including: portable humidifiers; water features; etc, and not just on the domestic water system. In order for these requirements to be achieved, Departments other than FM, such as Schools, Tenants, Campus Living, third party occupiers etc, must be involved in the process.

The assessments shall be commissioned by the WSG and the process managed by the Responsible Person (FM) or delegated person. They shall be carried out by the University's externally appointed specialist independent advisor who is totally independent and possesses the necessary competence and resources to complete the tasks proficiently and safely. New and revised risk assessments will be commissioned by the FM teams as and when required.

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 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:

- i. the risk to health, i.e. whether the potential for harm to health from exposure is reasonably foreseeable unless adequate precautionary measures are taken;
- ii. 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:

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

The assessments, written schemes and implementation of precautionary measures, will be carried out by someone with the necessary competence and resources to complete the tasks proficiently and safely. If the expertise required is not available within the University, it may be necessary to appoint one or more experts from outside the University with clear, written responsibilities and lines of communication.

The Risk Assessments will enable the Responsible Persons to demonstrate that all the pertinent factors, and the steps needed to prevent or minimise the risk, have been considered.

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

All risk assessments shall be periodically reviewed by the University's Responsible Person, with assistance from the University Risk Manager, to determine their validity status which shall be reported to the WSG on a quarterly basis. Where necessary and deemed by the University Risk Manager, new risk assessments will be commissioned by the WSG including under the following circumstances:

- i. there have been changes to the plant or water or its use (risk assessment to be reviewed by the University Risk Manager, Capital and FM collectively);
- ii. there have been changes to the use of the building in which it is installed (risk assessment to be reviewed by the University Risk Manager, Capital, FM, H&S and 'User' collectively);
- iii. the availability of new information about risks or control measures is made available (risk assessment to be reviewed by WSG collectively);
- iv. there have been changes to key personnel;
- v. the results of checks indicating that the control measures are no longer effective are made available.

In identifying and assessing the risks in any water system, and in drawing up and applying the necessary control measures, notice should be taken of the HSE Guidance Notes and British Standards described in the Policy Document.

The risk assessment shall take into consideration the following:

- i. The potential of bacterial contamination of the all areas of the system including plant and equipment.

- ii. The potential of bacterial amplification.
- iii. The potential of bacterial transmission.
- iv. The potential of exposure to the bacteria.
- v. The susceptibility of the user – determined by the IPC clinical risk assessment.

The risk assessment must take into consideration the following:

- i. The potential of bacterial contamination of the all areas of the system including plant and equipment.
- ii. The potential of bacterial amplification.
- iii. The potential of bacterial transmission.
- iv. The potential of exposure to the bacteria.
- v. The susceptibility of the user – determined by the IPC clinical risk assessment.

In addition, the risk assessment should include risk analysis on the following areas of the domestic and process water systems:

#### 5.1.1 Cold Water Services – Storage

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

#### 5.1.2 Cold Water Services – Distribution

- i. Physical condition of all associated distribution pipe-work (where reasonable accessible).
- ii. Design and configuration of all associated distribution pipe-work.
- iii. Temperature profiles of all associated distribution services and outlets.
- iv. Biological activities of all associated distribution services.
- v. Presence of dead-legs and areas of low-flow within all the associated distribution services.
- vi. Presence of flexible hoses, aerators, strainers, non-touch taps.
- vii. Presence of vending machines and water dispensers.
- viii. Usage considerations of all associated distribution services.

#### 5.1.3 Hot Water Services – Hot Water Generation and Storage

- i. Physical condition of all associated Hot Water Generating Units.
- ii. Design and configuration of all associated Hot Water Generating Units

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

#### 5.1.4 Hot Water Services – Distribution

- i. Physical condition of all associated distribution pipe-work.
- ii. Design, configuration and accessibility of all associated distribution pipe-work.
- iii. Temperature profiles of all associated distribution services and outlets.
- iv. Biological activities of all associated distribution services.
- v. Presence of dead-legs and areas of low-flow within all the associated distribution services.
- vi. Usage considerations of all associated distribution services.
- vii. Presence of space-heating within all associated distribution pipe-work.
- viii. Condition, temperature profiles and operation status of all showerheads within all associated distribution services.
- ix. Presence of flexible hoses, aerators, strainers, non-touch taps.
- x. Presence of undesired lengths of blended water pipe-work within all associated distribution services.

#### 5.1.5 TMVs and TMTs

- i. Condition, temperature profiles, accessibility and operation status of all TMVs/TMTs within all associated distribution services.

#### 5.1.6 Showers and associated shower heads

- i. Condition, temperature profiles, accessibility and operation status of all showers and associated shower heads within all associated distribution services.

#### 5.1.7 Adiabatic coolers

- i. Condition accessibility and operation status of units
- ii. Levels of chlorine dioxide
- iii. Levels of Legionella contamination

#### 5.1.8 Air Conditioning

- i. Physical condition of all associated Air Handling Units.
- ii. Design, configuration and accessibility of all associated Air Handling Units.
- iii. Method of humidification and operation status of all humidifiers within all associated Air Handling Units.

- iv. Condition, design and configuration of drip-trays within all associated Air Handling Units.
- v. Condition, design and configuration of glass traps/U-bends within all associated Air Handling Units.
- vi. Physical condition and hygiene standards of duct-work of all associated Air Handling Units.

#### 5.1.10 Other systems

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

#### 5.1.11 Management, Maintenance, Monitoring and Record Keeping

- i. Presence of and adequacy of all implemented monitoring and maintenance programmes in place by all relevant departments.
- ii. Presence of and adequacy of all implemented Record Keeping Programmes in place.
- iii. 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.

#### 5.1.12 Schematic Diagrams And Photographic Representation

- i. Schematic diagrams shall be produced for each system surveyed and will include schematic representation of all major distributions and associated plant installation/configuration. The schematic diagrams will be based on a non-intrusive basis and will be based on pipe-work/plant accessibility.
- ii. Electronic photographs shall be included in the report to illustrate the status and condition of the system surveyed and to highlight particular problems identified during the survey process.

## 5.2 Risk Assessment Status Notification:

A status of all Risk Assessments shall periodically be reported to the WSG by each Group member indicating the validity of each Risk Assessment and any requirements for their revision or renewal.

### 5.3 Post-risk assessment requirements:

#### 5.3.1 Preparation of remedial works "Priority Charts"

- i. From all data and information gathered during the Site Survey, a listing of Risk of Legionellosis Priority shall be produced for the site surveyed and a detailed "Remedial Works Priority Listing" shall then be produced in order to allow for the correct scheduling of all proposed works.

#### 5.3.2 Preparation of site specific "Pre-planned Maintenance" (PPM) Programmes)

- i. A detailed and sufficient Pre-Planned Maintenance Programme document shall be produced for each Site surveyed. The Programme shall include; the type of works, the frequency of works and all relevant works specifications.

#### 5.3.3 Interim Reports

- i. For all buildings/areas assessed to be of Moderate Risk or higher, the Risk Assessor Consultant shall issue an "Interim Problem Notification Form" indicating any necessary immediate corrective and remedial actions that need to be carried out. In addition, the "Interim Problem Notification Form" shall indicate the Short/Medium-term and Long-term corrective and remedial actions that need to be carried out.

#### 5.3.4 Consultancy Memoranda

- i. Any additional instructions and advice from the Risk Assessment Consultant shall be in the form of a "Consultancy Memorandum", which shall clearly indicate the nature of any faults/problems discussed and the resulting Risk caused. In addition, any corrective action or remedial works required, shall be clearly stated and listed and prioritised in terms of urgency.

### 5.4 Preparation of Action Plan

On completion of the Risk Assessments the WSG shall undertake the following procedure:

- i. Develop schemes for risk minimisation and control in order of priority giving consideration to cost, risk and difficulty.
- ii. List all buildings in priority order of non-compliance and potential risk.
- iii. Devise a management programme for the minimisation of risks so that an action plan identifying resources and timescales is drawn up.
- iv. Manage the programme and identify compliance failures for remedial action.
- v. 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.

## 5.5 Investment Plan Status

Each department must periodically report to the WSG on the status of the Investment Plan and how this affects completion of remedial works identified in the Risk Assessments.

## 5.6 Current status of Risk Assessments

For current Risk Assessment Status, please refer to Appendix 4.

## 6. INSPECTION MONITORING AND FAULT MANAGEMENT

### 6.1 Planned Maintenance Programme:

In order to ensure that the devised Water Safety Plan is effective in minimising or controlling the risk of Legionellosis, the University (or others on its behalf) will undertake a number of periodic inspection and monitoring tasks. The actual frequency of the tasks adopted, should depend on a number of criteria such as the type of building, type of occupants and history of the plant/system.

For the detailed Pre Planned Maintenance Task Specifications and Associated Processes employed across the various University buildings, please refer to [WSP Book 2 – FM Services Management](#).

### 6.2 Ad-hoc Risk Management and Control Processes:

The University (or others on its behalf) shall, in addition to the Planned Maintenance Programme described above, undertake certain *Ad-Hoc* and *As Required* tasks which will be required periodically. The execution of such tasks shall depend on a number of criteria such as: the condition of systems; the status of control measures; biological activity; etc. *Ad-hoc* and *As Required* tasks. For detailed Ad-hoc Process Specifications see [WSP Book 2 – FM Services Management and WSP Book 4 – Contingency Measures](#)

### 6.3 Contingency Management:

When the Water Quality Management and Control parameters have been breached and cannot be maintained, The University (or others on its behalf), shall ensure that the detailed processes and procedures described in [WSP Book 4 – Contingency Measures](#) are followed in order to enable the failing parameters to be brought back into control.

## 7. WATER SYSTEM AND PLANT DESIGN INSTALLATION AND MAINTENANCE

Management of water systems and associated end-of-line fittings to reduce the risk of microbial growth including opportunistic pathogens such as *Legionella sp.* is vital to user safety. It requires on-going maintenance and surveillance of control measures employed.

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

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

For detailed Water Systems and Plant Design, Installation and Management Specifications see [WSP Book 2 – FM Services Management](#).

## 8. DESIGN INSTALLATION AND COMMISSIONING OF REFURBISHED AND NEW-BUILD FACILITIES

The design, installation and commissioning of all new-builds and refurbished areas shall be carried out in accordance with the University's current Policy: Mechanical and Electrical Engineering Specification annual revision and in accordance to the requirements and specifications detailed in [WSP Book 3 – Capital Management](#).

Plant and water systems shall be designed and constructed to be safe and without risks to health when used at work. Such hazards maybe of a physical, chemical or microbial nature such as the risks associated with colonisation and growth of legionella bacteria within the water system.

The type of system installed depends on the size and configuration of the building and the needs of the occupants but the water systems shall comply with the recommendations outlined above. The design, installation, commissioning and hand-over of the hot and cold water services, new, extended or refurbished, in any of the University's premises shall also comply with all current legislation and guidance documents, British Standards and Best Practices.

Following any alteration to the Water system the installation will be accepted back by FM by the nominated representative of the appropriate FM department. This person will be trained and competent in Water Management and appointed by the University to carry out such tasks.

## 9. RECORD KEEPING

### 9.1 General Requirements:

To ensure that precautions continue to be carried out and that adequate information is available for checking what is done in practice, a record should be kept and maintained for at least five years showing the information specified in the ACOP.

Precautionary measures and treatments, monitoring results and remedial work should be logged and signed or initialled by the person who has carried out the work. Sufficient information should be recorded to show what measures have been taken and how they have been monitored.

The University utilises a proprietary Electronic Data Collection and Management System – COMPASS.

The detailed information required in the log will depend on the type and complexity of the system or water service to which it applies.

The purpose of a Log-Book system is to improve the efficiency and effectiveness of installation and maintenance, and also to provide a record of various tasks and observations so that the plant history can be reviewed at any time by the maintenance staff. It will prove essential to the maintenance engineer in the operation of a planned plant maintenance scheme, and, if properly followed, will prevent unacceptable conditions developing as a result of ineffective maintenance.

The Log-Book shall:

- i. Identify the installation requiring attention and how it operates.
- ii. Record results of the initial commissioning (if available) and any re-commissioning so that observations made during maintenance checks can be compared.
- iii. Define the maintenance task or observation required and the frequency.
- iv. Provide for the recording of maintenance observations and results and for comments to be made in respect of any defect seen during the inspection. This facility should exist for each item of plant individually and for overall system observations.
- v. Provide preliminary guidance on fault diagnosis and checking to assist with immediate on-site correction or adjustment.
- vi. Provide for, and make reference to, any separate observation sheet required to record extensive or abnormal observations which cannot be noted on the routine inspection sheets.
- vii. Facilitate cataloguing and cross-referencing to other Log-Books for plant/installations on the same Site (for example, the refrigeration plant, the chilled water installation, the air conditioning plant and the heat source).
- viii. Provide dates and results of inspections, tests and all associated works and procedures.
- ix. Provide dates for next scheduled inspection, test and associated works visits.

These entries shall bear the electronic signature of the person carrying out the task and should be suitably and safely retained and made available for inspection for at least five years from completion. Details of operational and functional tasks must be drawn up for the site by the Nominated Responsible Person or Appointed Person. These, together with the completion of Log-Books, will enable a proper historical record to be compiled of all works carried out and observations made.

## 9.2 COMPASS Operational Manuals:

 Compass Defect Log User Guide.pdf	 Compass Mobile User Guide.pdf	 Compass PDA User Guide.pdf	 Compass Alterations User Guide.pdf	 Compass User and Report Administration
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## 10. ON-GOING MONITORING AND AUDIT

The WSG shall, collectively, be responsible for auditing all processes being carried for the Management & Control of Legionella

**Regularly:** Each Departmental Representative shall carry out spot checks and action non-compliances.

**Six-Monthly:** Health & Safety will carry out compliance Audits of the flushing regime and COMPASS.

**Annually:** On behalf of the WSG Chair, an independent body shall carry out an annual 'Governance Audit'.

This shall include for an audit of the processes and procedures being carried for the Management & Control of Legionella of each Responsible Person (WSG Departmental Representative) and their department (either direct or indirect using the University's externally appointed specialist independent advisor) to assess compliance with the approved Code of Practice L8. This will be carried out to ensure correct and adequate implementation of the processes and procedures being carried for the Management & Control of Legionella.

The results of the audit shall be reported to the EMC, Health and Safety sub committee and then to the WSG within a month of the audit process.

## APPENDIX 1 EXAMPLE OF LETTER OF NOMINATION

Ref: .....

Date: .....

**FOR THE ATTENTION OF [NAME OF NOMINEE HERE]**

Dear [name of nominee here]

**Re:        Your nomination as [Enter department here] Department Representative onto the University's Water Safety Group (WSG)**

The WSG is a multidisciplinary group formed to accept ownership of delivering the highest water quality across the University by ensuring the correct management of water systems and other associated processes and practices, to reduce the risk of microbial growth including opportunistic pathogens such as *Legionella* which is vital to user safety in line with current guidance including ACoP(L8).

Irrespective of who chairs the WSG, you, as a nominated member shall be jointly accountable and responsible for ensuring that the WSG identifies microbiological hazards, assesses risks, identifies, implements and monitors control measures, and develops incident protocols.

The WSG's terms of Reference are attached for your consideration.

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This section to me completed by nominee

I have read and understood the WSG's Terms of Reference and I accept my position in the WSG as nominated.

[Name of nominee here] .....

Signature: .....

Date: .....

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This section to me completed by WSG chair

I authorise the nomination of [Name of nominee here] as a member of the University's WSG.

[Name of WSG chair here] .....

Signature: .....

Date: .....

## APPENDIX 2 DETAILS OF ALL PREMISES AND THEIR OWNERSHIP AND OCCUPATION STATUS



Buildings\_20151020.  
xlsx

APPENDIX 3 PERMIT NO. 1: PERMIT TO OCCUPY FACILITY OWNED BY OTHERS



Water Quality Management And Control PPM Programme

Permit No.	1
Task:	Permit to occupy facility owned by others

Application submitted by:  Date

Name and address of facility to be occupied:  Occupation Extent (%)

Facility owned by:

Facility occupied previously by the University (Y/N):  When

Facility to be occupied by:  When

Period of proposed occupation:

Maintained by:  SLA Status

Method(s) of bacterial control employed:

Suitable and sufficient risk assessment available? Yes  No  Reported Level of Risk

Water systems managed adequately? Yes  No  Adequate records present (Y/N)

This section to be completed by University Department Lead

Occupation approved?

**University Nominated FM Representative: Signed: .....**

**NOTE: TO ALLOW FOR OCCUPATION OF FACILITY THIS PRO-FORMA MUST BE ACCOMPANIED BY ALL APPROPRIATE RECORDS AND CERTIFICATES**

## APPENDIX 4 CURRENT RISK ASSESSMENT STATUS

This information is available in the “Control Document Library” or available from the Hydrop ECS “Client Web Portal via the Responsible Person. In order to access this portal, please contact the Responsible Person for access settings permission.



Web-Portal-User-Gui  
de.pdf

## Appendix 5 DOCUMENT CONTROL

<b>Issue No</b>	<b>Version</b>	<b>Revised by</b>	<b>Summary of revision</b>	<b>Date of revision</b>
1	V1	DH	Original draft	June 2016
1	V2	DH	Document control element added at back of book	July 2017
1	V3	DH	General review with minor updates	July 19