Health and Safety Code of Practice SCP41: Management and Control of Water Quality, Legionella and Associated Risks

Responsible for this policy
Registrar and Chief Operating Officer

People who need to read this policy
Faculties, Estate Development, Campus Services, and Contractors

Relevant to Academic Partnerships?
No

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Responsible for reviewing this document
Associate Director, Safety, Health and Environment

Relevant documents
- Health and Safety at Work etc. Act 1974
- General Data Protection Regulation 2018
- Management of Health and Safety at Work Regulations 1999
- Health and Safety Executive Approved Code of Practice and Guidance, L8 (2013)
- HSG274 Legionnaires Disease – Technical Guidance Parts 1, 2 and 3 (2014)
- Water Supply (Water Fittings) Regulations 1999
- Water Supply (Water Quality) Regulations 2016

- Water Regulations Advisory Scheme
- Construction (Design and Management) Regulations 2015
- Department of Health's Report of the Expert Advisory Committee on Biocides S6700:2006+A1:2009 Specification for the Design, Installation, Testing and Maintenance of Services Supplying Water for Domestic Use within Buildings and their Curtilages
- Control of Substances Hazardous to Health Regulations 2002 (as amended)
- Public Health (Infectious Diseases) Regulations 1988
- Food Standards Act 1999
- Notification of Cooling Towers and Evaporative Condensers Regulations 1992

Related policies and documents

- Liverpool John Moores University Health and Safety Policy Statement.
- MCP1 Organisation for the Implementation of the Health and Safety Policy
- MCP2 Arrangements for the Implementation of the Health and Safety Policy

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Health and Safety Code of Practice SCP41: Management and Control of Water Quality, Legionella and Associated Risks

> **Important**
> This code of practice forms part of the university's health and safety policy and replaces all previous issues.

Objective

The objective of this Code of Practice and its appendices is to provide a framework for the management and control of water quality and risks arising from the presence of Legionella bacteria (at hazardous levels) in any water system controlled by the university.

Note: This Code of Practice is based on various statutory requirements and good practice but specifically the Health and Safety Commission Approved Code of Practice and Guidance, L8 The Control of Legionella Bacteria in Water Systems (ACOP L8): http://www.hse.gov.uk/pubns/priced/l8.pdf.

Summary and Policy Statement

As Legionella is a naturally occurring organism, widely dispersed in nature, it must be accepted that there is a constant risk of the bacteria entering the water distribution and building engineering services of university properties. The size and complexity of the university's estate naturally increases this likelihood.

Measures to be taken for the university to discharge management of this risk are contained within the Appendices to this Code of Practice and the Water Safety Plan developed by the university's Legionella Compliance Contractor, Estate Development's duly appointed agents.

In principle, the objective is that Estate Development, supported by its duly appointed agents, will have control over all relevant plant and equipment. It is acknowledged that there may be occasions where this may not be feasible, for example experiments using specialised equipment that may be remote from the water supply. In such cases, Estate Development's Responsible Person must be notified and no work undertaken until such time as the Faculty confirms that it has individuals in place with parallel responsibilities in regard to the plant and equipment detailed in Section 'Responsibilities' below and in Appendix 3 and that it has arrangements which meet the requirements of Regulations, Approved Codes of Practice and this Code of Practice. Upon such confirmation, authorisation to proceed will be given by the Estate Development's Responsible Person. Please refer to Section 'Management and Control of Access to Systems', subsection 'Systems under Control of Faculties and Common Ownership' for further information.

Policy Statement

Liverpool John Moores University recognises and accepts responsibility as an employer for providing, in so far as is reasonably practicable, a safe and healthy working environment for its employees. In addition, it will ensure in so far as is reasonably practicable, that persons other than employees (e.g., students, visitors, contractors etc.) do not have their health and safety exposed to preventable risk.

The university requires employees to take reasonable care of their own health and safety and that of other persons who may be affected by their acts or omissions at work. Employees are also required to co-operate with the university so that it may discharge its own statutory obligations.

Procedures and Operational Arrangements

Procedures and operational arrangements for the management and control of risks arising from Legionella in water systems are appended to this Code of Practice and detailed within Estate Development's duly appointed agents' Water Safety Plan (WSP).

Responsibilities

Duty Holder (Vice-Chancellor)

Has overall responsibility to ensure that this Code of Practice for the Management and Control of Water Quality, Legionella and Associated Risks is implemented, and that suitable and sufficient resources are available to discharge any requirement associated with the same.

In practice the Duty Holder will delegate day-to-day implementation to the Responsible Person who in turn delegates this responsibility to the Water Quality and Legionella Control Manager. However, the Duty Holder will retain the duty of appointing the Responsible Persons.

In those cases where it may not be feasible for Estate Development to have control over the relevant plant and equipment, the Faculty Pro-Vice-Chancellors must take on the role of Responsible Person and make other appointments as indicated below.

Responsible Person (Director of Estate Development) and Faculty Pro-Vice-Chancellor

Director of Estate Development

Will implement this Code of Practice in association with the Water Systems Management Team, which will meet twice yearly.

Will appoint a Deputy Responsible Person (Water Quality and Legionella).

Will appoint Water Quality and Legionella Control Manager(s) to assist in the day-to-day management, administration and monitoring of the Policy.

Will appoint a competent independent Water Systems Consultant to undertake an annual audit and review of the University's arrangements and procedures and report on the level of compliance to the Water Systems Management Team.

Will ensure that risk assessments are carried out bi-annually by Estate Development's duly appointed agents and/or following any significant change or alteration to systems falling within the scope of this Code of Practice.

Will identify and request the necessary funding required to implement the procedures detailed in this Code of Practice and any improvement or alterations required to comply.

Will identify staff training requirements and commission provision of the required training.

Faculty Pro-Vice-Chancellor

Will implement this Code of Practice in association with the Water Systems Management Team, which will meet twice yearly.

Will appoint a Deputy Responsible Person (Water Quality and Legionella).

Will appoint Water Quality and Legionella Control Manager(s) to assist in the day-to-day management, administration and monitoring of the Policy.

Will ensure that risk assessments are carried out bi-annually and/or following any significant change or alteration to systems falling within the scope of this Code of Practice.

Will identify and request the necessary funding required to implement the procedures detailed in this Code of Practice and any improvement or alterations required to comply.

Will identify staff training requirements and commission provision of the required training.

Deputy Responsible Person (Head of Estate Maintenance and Infrastructure) and Faculty Pro-Vice-Chancellor Nominee

Head of Engineering Services and / or Head of Estate Maintenance and Infrastructure

Will monitor the efficacy of the procedures and control mechanisms.

Will ensure adequate and consistent records are maintained throughout the university.

Will deputise for the Responsible Person when they are not available.

Faculty Pro-Vice-Chancellors' Nominee

Will monitor the efficacy of the procedures and control mechanisms.

Will ensure adequate and consistent records are maintained throughout the Faculty.

Will deputise for the Faculty Pro-Vice-Chancellor when they are not available.

Independent Water Systems Consultant

Estate Development and the Safety, Health and Environment Department will appoint an independent consultant to support and assist the Responsible Person in devising and reviewing appropriate policies and procedures for the maintenance of water quality and control of Legionella.

The Consultant will assist and advise on implementation of the Policy.

The Consultant will provide independent auditing and evaluation of control measures and test results and report the level of compliance to the Water Systems Management Team.

The Consultant will provide assessment of competence for nominated Duty Holders.

Water Quality and Legionella Control Manager (Engineering Services Manager) and Faculty Pro-Vice-Chancellor Nominee

Engineering Services Officer

Will ensure Estate Development's duly appointed agents effectively discharge their duties under section 4.7 through monitoring processes and monthly meetings.

For plant/systems outside scope of the duly appointed agents:

Will advise on potential areas of risk and identify where systems do not comply with current standards/guidance.

Will advise on the required controls and procedures for the prevention of Legionella.

Will ensure that suitable and sufficient mechanisms are in place for the operation and maintenance of plant and systems falling within the remit of this Code of Practice.

Will ensure adequate records are maintained.

Will ensure that up to date schematic drawings are available for all water systems.

Will ensure that all staff (directly employed or contractors) are suitably trained in and aware of the standards required and expected of them in discharging their duties in compliance with this Code of Practice.

Will maintain records of inspections, cleaning, disinfection and pasteurisation regimes, maintenance, alterations, repairs and operational anomalies.

Faculty Pro-Vice-Chancellors' Nominee

Will advise on potential areas of risk and identify where systems do not comply with current standards/guidance.

Will advise on the required controls and procedures for the prevention of Legionella.

Will ensure that suitable and sufficient mechanisms are in place for the operation and maintenance of plant and systems falling within the remit of this Code of Practice.

Will ensure adequate records are maintained.

Will ensure that up to date schematic drawings are available for all water systems.

Will ensure that all staff (directly employed or contractors) are suitably trained in and aware of the standards required and expected of them in discharging their duties in compliance with this Code of Practice (note: all contractors must be appointed though Estate and Facilities Management).

Will ensure records of inspections, cleaning, disinfection and pasteurisation regimes, maintenance, alterations, repairs and operational anomalies are maintained.

Deputy Water Quality and Legionella Control Manager (Estate Manager/s, Maintenance and Facilities) and Faculty Pro-Vice-Chancellor Nominee

Estate Development Building Surveyor and/or Senior Project Manager

Will deputise for the Water Quality and Legionella Control Manager (WQLCM) when they are not available.

Faculty Pro-Vice-Chancellors' Nominee

Will deputise for the Water Quality and Legionella Control Manager (WQLCM) nominee when they are not available.

Approved Code of Practice L8 (ACOP L8) Compliance Contractor Estate Development's Appointed Agents

Will advise on potential areas of risk and identify where systems do not comply with current standards/guidance; where referenced contractually, such standards/guidance must be met in full.

Will advise on the required controls and procedures for the prevention of Legionella.

Will ensure that suitable and sufficient mechanisms are in place for the operation and maintenance of plant and systems falling within the remit of this Code of Practice.

Will ensure adequate records are maintained.

Will ensure that up to date schematic drawings are available for all water systems.

Will ensure that all staff (directly employed or contractors) are suitably trained in and aware of the standards required and expected of them in discharging their duties in compliance with this Code of Practice.

Will maintain records of inspections, cleaning, disinfection and pasteurisation regimes, maintenance, alterations, repairs and operational anomalies.

Will ensure that risk assessments are carried out bi-annually and or following any significant change or alteration to systems falling within the scope of this Code of Practice.

Will produce written control schemes for each of the systems under their control.

Will carry out the monitoring regime as detailed in the scheme of control, Water Safety Plan, ACOP L8, and this Code of Practice.

Will record results on the University monitoring software (electronic log book).

Will advise the WQLCM or Deputy WQLCM of any defects found while carrying out works.

Will carry out disinfection and cleaning of systems in line with the Water Risk Assessments, Written Control Schemes, WSP and Approved Code of Practice L8 and British Standards.

Will ensure that their operatives are fully trained in the requirements of ACOP L8.

Will comply with the Estate Development Code of Conduct for Contractors and the University Safety Code of Practice SCP10 Contractors.

Will be members of the Legionella Control Association and abide by their Code of Conduct.

Will provide risk assessments and method statements when carrying out works on the university sites.

Will be appointed through Estate Development.

Training and Competence

Only competent persons (as defined in ACOP L8 and HSG274) will be authorised to conduct Legionella works. A person shall be deemed competent to conduct the appropriate operation only if they have satisfactorily completed a University approved course on Legionella control, or have appropriate qualifications, sufficient knowledge and experience of the testing and control measures required.

All Estate Development staff involved in the design, installation, management, maintenance or repair of water systems within the University will receive training in the management and control of Legionella appropriate to their level of responsibility. All such training will be undertaken by a competent training provider.

Records of training undertaken by university staff will be kept centrally in the Estate Development Legionella Sharepoint folder (Estate Development Safety and Training). Estate Development's duly appointed agents will retain their own training records which the University and its appointed Independent Water Systems Consultant may request evidence of periodically.

The roles and responsibilities of contractors involved in the control regime shall be defined, in writing, in contract documents. Any agreed deviation from the initial contract documents shall be mutually agreed and documented as part of the contract review process.

Contractors appointed to undertake Legionella control operations, e.g., tank cleaning and chlorination, will be required to fully conform with the requirements of this Code of Practice.

Additionally, such contractors shall comply with the following:

• They shall be members of the Legionella Control Association and comply with the ‘Code of Contract for Service Providers’

• All contract operatives undertaking Legionella work shall have successfully completed a City and Guilds or Water Management Society accredited course

• The Responsible Person or their Deputy must be assured of the technical competence of any Contractor prior to appointment

• Completion of the Estate Development Contractor Induction

All contractors working on water systems within the university, in whatever capacity, shall be required to demonstrate their competence to do so, an example being registration under the Water Regulations Advisory Scheme (WRAS).

In addition, all contractors shall be subject to periodic monitoring to ensure appropriate standards are met and maintained.

Management and Control of Access to Systems

Estate Development

The Construction (Design and Management) Regulations require information about existing water distribution/water using/condensate producing systems to be provided to persons proposing to add/modify the same. This ensures that designers of the modifications make due allowance for continued compliance and system integrity.

Estate Development staff (and any consultants appointed by them) shall be responsible for effective design and management of all such schemes including proposals for appropriate commissioning to an agreed protocol with the Deputy Responsible Person before any works on site commence, providing detailed information on the proposals to the Water Quality and Legionella Control Manager.

They will also be responsible for ensuring that plant and services are capable of meeting any increased demand where a system is extended and for the provision of as fitted drawings at the time of handover, together with all commissioning data.

No system will be commissioned or operated unless the Deputy Responsible Person has given formal consent that the works have been discharged to the required standard.

Where alterations to installed water systems are proposed for the purpose of reduction in water consumption, the proposer will provide detailed information demonstrating that all reasonably foreseeable risks have been assessed and that all reasonably practicable steps have been taken to design out risk before commissioning works.

Mains pipes are the responsibility of Estate Development.

Contractors

All contractors employed by Estate Development will be held responsible for ensuring that they (and any subcontractor acting under their instruction) are both competent to undertake any work instructed and conduct the same in a way that is compliant with legislation, Approved Codes of Practice and this Code of Practice.

Systems Under Control of Faculties and Common Ownership

Where a Faculty has control and/or ownership of any device, appliance, article or system falling within the scope of this Code of Practice (for example experiments using water, submersion pool, cistern or vessel containing water likely to exceed a mean temperature of 20°C or an evaporative cooling tower), the Faculty Pro-Vice-Chancellor will be responsible for nominating individuals with parallel responsibilities in regard to the plant and equipment detailed in Section 'Responsibilities' above and in Appendix 3 and for making arrangements which meet the requirements of Regulations, Approved Codes of Practice and this Code of Practice.

The Faculty Pro-Vice-Chancellor will be required to provide confirmation of the above to the Responsible Person (Director of Estate Development). Upon such confirmation, authorisation to proceed will be given by the Director of Estate Development.

Such plant and equipment will be added to the contract with the Independent Water Systems Consultant, appointed by Estate Development and the Faculty will be required to cooperate in any safety audit implemented by the same.

Modifying Water Distribution Systems

The modification of any hot or cold water system by other than Estate Development and Facilities Management or their duly appointed agents is not permitted. Modification will be taken to include making any permanent connection to any water system pipe work that involves removing fittings or drilling pipe work.

Connection of Appliances to Domestic Water Distribution Systems

Connection of appliances or devices to hot or cold water systems by anybody other than duly appointed agents of Estate Development is not permitted. The term 'connection' is defined as effecting or commissioning any physical link between an appliance or accessory and a fixed water services pipe or outlet.

The Control Process

The university will:

• Carry out an assessment of water quality and the risks arising from any circumstances identified as likely to promote the growth of harmful bacteria (possible presence of the Legionella bacteria)

• Prepare a written scheme for each system for preventing or controlling any risks identified

• Implement, manage and monitor preventative measures

• Maintain detailed and appropriate records

• Implement and maintain a system for responding to situations of enhanced risk or actual infection

• Provide advice and guidance on the commissioning and installation of new plant/ alterations, adaptions or extensions to existing services falling within the remit of this Code of Practice.

Design of Systems

Any new system falling within the scope of this Code of Practice must be designed by competent persons and be fully compliant with the Water Supply (Water Fittings) Regulations 1999 and any Approved Codes of Practice, Standards and industry guidance cited therein. Designers' risk assessment will be carried out to demonstrate how the water system complies with ACOP L8 and HSG274 Parts 1, 2 and 3.

Appendix 1

Procedures and Operational Arrangements for the Management and Control of Risks Arising from Legionella in Water Systems

Introduction

Building owners have a responsibility to ensure that the water storage and distribution facilities they provide in their properties achieve the desired standards (within accepted criteria). This is generally achieved by the implementation of a risk assessment based regular monitoring and control protocol. Water quality has been the subject of much publicity and discussion, fuelled by recurring outbreaks of Legionnaires' disease and an increasing awareness of the measures available to control and maintain acceptable standards.

Liverpool John Moores University recognises and accepts its responsibility to take every reasonable precaution necessary to protect the health, safety and welfare of students, staff, visitors and all persons within the surrounding area of their premises from the consequences of activities under its control.

Legionnaires' disease can prove fatal and it should be noted that subsequent investigations of all fatalities arising from contraction of the same have shown that death could have been prevented. Accordingly, Estate Development's duly appointed agents will devise and implement a range of measures across their buildings portfolio to protect the health, safety and welfare of students, staff, visitors, contractors and other persons who may be at risk from activities carried out in the university buildings.

The consequences of such an outbreak, coupled with the associated public attention attached to even a suspected outbreak, necessitates the need for clear, concise guidelines to be devised, adopted and published setting out measures to be taken to prevent the Legionellae bacterium becoming active within the buildings owned, managed or maintained by the University and Estate Development's duly appointed agents.

Water services and in particular hot water services installations, humidifiers and cooling towers, together with air handling systems have been highlighted as potential areas of significant risk and thus require close scrutiny regarding maintenance techniques and procedures. This has been emphasised by many studies of such services and in available documentation relating to maintenance and monitoring of water systems.

In new, unoccupied or partially occupied buildings, special care must be exercised, as the circumstances therein require bespoke solutions dependent upon circumstances encountered.

User Guide

This Appendix contains much detail as it describes the relationship between Building Services Design, Maintenance, Legislation, Microbiological/Contaminant Control and the associated procedures that are required to manage water supplies within properties occupied by the University to limit the risk associated with Legionnaires' disease and compliance with relevant Standards/Codes of Practice.

A Policy Statement is included within this Code of Practice in the Section 'Summary and Policy Statement'. The following outline how the University will achieve compliance with this Policy.

Properties of Legionella

Water has many uses, i.e., drinking, bathing, cleaning etc. It can also be used as a primary heating/cooling medium for heating/chilled water purposes. However, water can cause serious injury when its temperature is too extreme to be tolerated by the body (in excess of 43°C). It can also be a vehicle for infectious microorganisms. The university has a duty to make proper use of water services and, additionally, it has a statutory responsibility to take appropriate measures for the control of all water-borne micro-organisms such as Legionella.

The effectiveness of precautionary measures should be regularly monitored and a continuing programme of awareness should be initiated. It should be noted that the greatest risk of Legionella propagation comes from institutionalised complacency that allows deterioration of water hygiene to such an extent that an outbreak of disease occurs. The university, supported by Estate Development's duly appointed agents, should endeavour to remove this threat wherever possible and, additionally, aspire to eliminate all potential sources of growth and spread of Legionella. Where this ideal may not be achievable in existing situations, such steps as may be reasonably practicable should be taken to control Legionella by proper management of water systems.

Legionella pneumophila is the bacterium that causes Legionnaires' disease. There are currently 43 identified species of bacteria with 16 sero groups; sero group 1 has been

identified as the most likely to propagate in the UK. The disease is classified as a pneumonia-type infection of the lower respiratory tract. The infection is most commonly acquired by the inhalation of air-borne droplets or particles containing viable Legionellae bacteria. There were 169 clinically diagnosed incidences of Legionnaires' disease in 2017, with death occurring in approximately 10% of cases.

Investigations have shown that the occurrence of Legionellae contamination is greater in hot and cold-water services than in cooling towers. However, it should be remembered that the contamination footprint (the area an aerosol may be transported over by air currents) of a wet cooling tower is larger than any other likely source.

Legionellae ecology in water systems is not entirely understood. However, the following conditions have been documented as affecting its rate of growth.

The presence of sediment, sludge, scale and organic material in water systems can provide nutrients and protection for Legionellae. Additionally, Legionellae have been shown to colonise certain types of material used in the construction of water systems, many of which also provide nutrients. Note: New water system installations must be constructed using Water Regulations Advisory Scheme (WRAS) approved materials to reduce potential propagation.

Other organisms commonly encountered in water systems such as bacteria, amoeba and algae can provide a suitable nutrient and habitat in which Legionellae can survive, concentrate and multiply.

Biofilms can harbour and provide favourable conditions for Legionellae growth. Legionellae can grow in Protozoa. Legionella bacteria contained within biofilms may be protected from biocides that would otherwise kill or inhibit growth within the water system by those same host organisms.

Legionellae has been shown to proliferate best in water systems that have a temperature between 20°C and 45°C. Human blood temperature (approximately 37°C) provides the optimum ambient temperature for the propagation of Legionella bacteria. Stagnant water within the above temperature range appears to provide the ideal conditions to promote colonisation by Legionellae.

Legionellae will survive at temperatures below 20°C but is considered to be in a dormant state with no colonisation activity. The bacterium does not survive temperatures maintained consistently at 60°C or above.

Legislation and Guidance

Approved Codes of Practice and Guidance (L8) and HSG274 Parts 1, 2 and 3

The Health and Safety Executive's Approved Code of Practice and Guidance (L8) The Prevention and Control of Legionellosis (including Legionnaires disease) and the Codes of Practice/Guidance documents referred to therein will be used to source the detailed technical advice on design, maintenance, operation and management of water systems.

The University recognises its responsibility to implement in full the recommended Codes of Practice as outlined in L8 in order that it can properly manage and control its water supply systems by:

• Identifying and assessing sources of risk

• Preparation of a scheme for preventing or controlling the risks identified

• Implementation and pro-active management of monitoring/preventative procedures

• Design and introduction of a safe system of working

• Keeping records of the precautions implemented for each of the premises within the University's control.

Health and Safety at Work etc. Act 1974

The University's management have a duty to ensure that there is an appropriate regime for the proper design, installation and maintenance of plant and systems.

Management of Health and Safety at Work Regulations 1999

To comply with these Regulations the university must make a systematic assessment of risks to health and safety for their employees and others arising from work activities.

Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended)

The Regulations require the University to ensure that suitable measures are in place to protect staff and others whilst carrying out their normal duties.

Public Health (Infectious Diseases) Regulations 1988

The University must have suitable and sufficient arrangements in place to notify the Consultant for Communicable Disease Control at the Local Authority in the event of a serious outbreak of any disease thought or found to have originated from University premises.

Water Supply (Water Quality) Regulations 2016

The University must ensure that water is stored correctly and that correct measures are taken to avoid water system contamination.

Food Standards Act 1999

The university must ensure observance of this Act when water is used in the preparation of food and drinking purposes.

Notification of Cooling Towers and Evaporative Condensers Regulations 1992

The university is required to register such units with the local authority and are subject to their inspections and requirements.

Additional Guidance

1) CIBSE TMI3: Minimising the Risk of Legionnaires Disease

2) BS6700: Specification for the Design, Installation, Testing and Maintenance of Services Supplying Water for Domestic Use Within Buildings and Their Curtilages

3) Health Technical Memorandum HTM 04-1 Safe Water in Healthcare Premises

4) Statutory Instrument 1992 No 2225 Health and Safety Commission, The Notification of Cooling Tower and Evaporative Condenser Regulations 1992

5) The Water Fitting and Materials Directory

6) Institute of Plumbing (IOP) Engineering Services Design Guide

7) Legionella Control Association Code of Conduct for Service Providers

8) HSG282 The control of legionella and other infectious agents in spa-pool systems

9) BS8580: 2010 Water Quality: Risk Assessments for Legionella Control Code of Practice

10) Report of the Expert Advisory Committee on Biocides

High-risk Conditions

Water temperatures between 20°C and 45°C promote growth of Legionella. The optimum temperature for organic growth is 37°C. Therefore, water supplies should be kept out of this range wherever practicable. Organisms may remain dormant in cool water and multiply only when the temperature reaches a suitable level.

Sediment, sludge, scale and organic materials are a principal nutrient source for Legionella. Iron oxide will also promote and assist the growth of Legionella in storage tanks and service pipework. Therefore, there is a requirement for regular cleaning of such services.

The use of some rubbers, leathers, jointing compound, mastics, wooden packing and certain plastics should be avoided as they can provide a nutrient source for Legionella. Guidance is available from the Water Research Centre; see the Approved Code of Practice and Guidance (ACOP L8).

Organisms in water such as algae, amoebae and other bacteria, may serve as an additional nutrient source for Legionella. Thus, a contemporaneous condition survey-based disinfection and cleaning programme/procedure is essential.

Biofilms may form within a water system and it is known that they provide a nutrient source and a safe harbour for Legionella. A biofilm is primarily a layer of microorganisms combining in a matrix that forms a surface slime in contact with water.

Exposure of water to sunlight may stimulate the growth of algae and the formation of slimes. Additionally, stagnant water encourages colonisation of Legionella.

High-risk Areas

High-risk areas include the following:

• Water systems incorporating a cooling tower

• Air-conditioning systems, humidifiers, cooler coils and fan coil installations

• Spa baths and pools

• Hot water services and storage vessels (including shower facilities)

• Cold water services and storage cisterns (including fire hose reels and emergency drenching showers)

• Water systems incorporating an evaporative condenser

• Any systems that produce aerosols that may exceed a temperature of 20°C

Methods of Prevention

Methods of prevention include the following:

• Removing all taps and outlets and associated pipe work which are not used or are under-used. Utilise a flushing regime for infrequently used outlets.

• Ensure that the water temperatures for calorifiers, hot water generators and hot water storage vessels are maintained at a temperature at or above 60°C and that this temperature does not fall below 50°C at any point within the circulation pipework. This will also include the regular inspection and monitoring of any trace heated hot water distribution systems. Further guidance is given in HSG274 (part 2) in relation to providing a representative temperature sample of the hot water systems taking account of subordinate flow and return loops and localised (tertiary) loops.

• Ensure that the use of pipe work carrying blended water at temperatures of between 25°C and 43°C minimum is restricted and if unavoidable, kept as short as is practically possible.

• Removal of dead-legs or spurs from the hot and cold-water circulatory system where practicable.

• Avoid stagnation by reviewing storage capacity against turnover.

• Maintain a suitable and sufficient standard of cleanliness of water, air conditioning and ventilation systems.

• Use of the proper water treatment regime in wet cooling towers.

• Introduce the correct level of maintenance to ensure correct and safe operation and compliance with statutory Regulations.

• Reduce the amount of water stored (24 hours maximum).

• Keep all water storage systems clean and sealed from extraneous matter and maintain temperatures below 20°C for cold-water services.

• Consider a system of continuous dosing of the incoming cold-water services using a recognised chemical solution or other approved means that would assist in reducing the risk from Legionella and other water borne micro-organisms.

Identification of Installations at Risk

Risk Assessment Procedures

Legionnaires' disease is most commonly caused by the inhalation of contaminated water droplets. It is therefore necessary to identify the sources of possible infection where respirable water sprays or aerosols are created.

The Approved Code of Practice (ACOP) and Guidance (L8) require that all systems susceptible to colonisation by Legionella and which may create water droplets must be identified and then risk assessed.

The ACOP clearly states the requirement for employers and others to undertake assessments to establish the risk of Legionella. In pursuance of this policy the responsibility to carry this out rests with Estate Development's duly appointed agents (for plant/systems controlled by Estate Development and is monitored by the Water Quality and Legionella Control Manager, supported by the Responsible Person. For plant/systems controlled by Faculties, the responsibility rests with the Responsible Person (Faculty Pro-Vice-Chancellor.

A number of factors are required to create a risk of acquiring Legionellosis, namely:

1. The presence of the bacteria

2. Condition of the water and the existence of suitable conditions for the organism to grow and multiply in the storage and distribution systems, i.e. suitable temperatures (ideally between 20°C and 45°C) and a source of nutrients e.g. organic matter such as sludge, scale, rust or algae

3. The presence of people

4. A means of creating an aerosol or small breathable droplet, such as from a shower

If at least one of these factors is missing, then Legionnaires' disease is less likely to occur. If all factors are present then the objective must be to remove one or more of them. In practice, the risk can be dealt with by identifying potential sources of transmission and preventing conditions that may allow the proliferation of Legionella bacteria.

Whilst there may be common factors associated with the premises in the university, the individual nature of each building should be considered when developing the associated risk assessment. A site survey of the water system(s) should be undertaken for each building, and it should identify all plant and equipment such as humidifiers, cooler coils, calorifiers, boilers and pumps etc. connected to water systems or producing water as a by- product of its normal working processes. 'As-fitted' drawings or a schematic diagram showing the configuration of services shall be produced as well as a description of the water system indicating the normal operating parameters, maintenance schedules and actions to be taken should abnormal situations occur.

Where there is a risk, the significant findings should be recorded, and employees informed. Actions identified to control the risk should be monitored at suitable intervals to ensure effectiveness and assessments should be reviewed regularly and specifically when there is reason to believe that the original risk assessment may no longer be valid or frequently if

changes to the system are made or risks change. A detailed list of considerations is contained in HSG 274, Appendix 2.1.

In carrying out the risk assessment the following should be borne in mind:

• HSE considers Legionella infection to be preventable

• Legionella is present in most water systems and as such, it cannot be eradicated but it is possible to control the risk of infection

Estate Development's duly appointed agents, monitored by the WQLCM, will initially review the record drawings and schematics of all the water systems. The drawings will show:

1. Layout and arrangement of all calorifiers and pumps

2. Layout and arrangement of all cisterns, humidifiers and cooling towers

3. All other water systems that may present a Legionellosis hazard

4. Dead-legs and blind ends, with lengths and diameters indicated

5. Operation and checkpoints for cross-referencing with operation instructions and temperature records

Estate Development's duly appointed agents, monitored by the WQLCM, will note any deficiencies in the record drawings and/or schematics and the locations where obvious controls are not in place or where dead-legs are excessive. The WQLCM will also review the documentation of the engineering design and the level of maintenance and operational procedures being performed.

Estate Development's duly appointed agents, monitored by the WQLCM, will then arrange for the physical inspection of the various water systems from the entry sources to the University's property to the various water outlets, including the following:

1. Tracing all water pipework systems

2. Measuring the time taken to achieve recommended temperatures at hot and cold-water outlets

3. Checking layouts and arrangements of tanks, cisterns, calorifiers, pumps and humidifiers

4. Measuring water temperatures at all cisterns, calorifiers, humidifiers and cooling towers and at all other strategic points to ensure and verify compliance

5. Identifying any redundant or infrequently used water outlets together with the associated pipework that could be removed

Upon completion of these surveys, the Water Systems Management Team will ensure Estate Development's duly appointed agents consider the risk and develop a scheme for risk control in order of priority.

The assessment should be reviewed regularly and specifically when there is reason to believe that the original risk assessment may no longer be valid. Such circumstances would typically include:

a) Changes to plant or water systems or its use

b) Changes to the use of the building in which the water system is installed

c) New/revised information relating to risk or control measures

d) The results of checks that indicate that control measures are no longer effective. These may be elevated Total Viable Count levels or a positive sample analysis result when tested specifically for the presence of Legionellae.

Aerosol Sources

The following sources are those most likely to promote conditions where Legionellae will thrive and are capable of creating water droplets that become airborne and in turn can be inhaled.

Cooling Towers Including Evaporative Condensers

The university no longer has cooling towers as they have been recently removed and replaced by a sealed cooling system. It is not envisaged that Estate Development will install evaporative cooling towers in the future.

Air Conditioning Plant and Ductwork

Within air handling units, water pools can form from accumulations of water droplets being arrested on filter elements. This water is susceptible to contamination by particulates collected alongside on the filter element.

Condensate drip trays under cooling coils are specifically designed to collect the condensing moisture formed on the coil face and this standing water can be contaminated directly with airborne particulates or via the drainage system if inadequate precautions have been taken to ensure that an air break is included within the discharge pipes.

Within an air conditioning system, accumulations of water occur at various points throughout the distribution ductwork, depending on weather conditions and the dictates of the control system.

Hot and Cold-Water Systems

The potential risk within hot and cold-water systems can be increased by a number of factors including: excessive water storage capacities; inadequate sealing of water tanks by the lack of lids/ill-fitting lids; unscreened over-flow pipes; and inadequate or unsuitable thermal insulation. Lack of circulation and flow in water tanks created by unsuitable or incorrect positioning of water inlet and discharge connections resulting in stagnation should also be considered.

Temperature stratification, stagnation and sediment build up can occur in domestic hot water calorifiers and heaters.

Hot water systems should supply water to all outlets or thermostatic mixing valve at a temperature of at least 50°C. In some cases, this may prove difficult to achieve because of inadequate insulation or poor circulation. In such cases, careful risk assessment of these circuits and outlets must be made to determine the appropriate action.

Pipework dead-legs have been found to contribute to the proliferation of Legionellae in that they often contain sediment, sludge and scale. In some instances where the outlet being served is infrequently used, water temperatures stabilise within the critical range. Positioning of drain cocks on distribution pipework should be given due consideration to prevent the creation of avoidable dead-legs.

Showers and Spray Heads

Showers are a potential source of infection by Legionellae bacteria. The risk potential increases with reduction in use and the lack of a facility to dump blended water between operations. Water retained within the shower unit can remain within the ideal proliferation range until the next user operates the shower, thereby creating an aerosol spray from water that may have remained stagnant.

Further consideration within the category of showers should be given to the equipment utilised in kitchens to pre-wash dirty dishes. This type of spray unit is invariably complete with a hand operated control valve linked by flexible or solid connections to the hot and cold-water supplies, whose valves are left at pre-set positions to achieve the desired temperature blend. This may give an ideal breeding temperature for the bacteria when not in use but can also cause cross-contamination between hot and cold systems as a result of pressure variations. Also, within this category, are spray taps attached to wash hand basins within toilet facilities. These taps again create the ideal spray to promote water aerosol.

Spas, Whirlpool Baths and Immersion Tanks

Spas, whirlpool baths and immersion tanks can under certain conditions create a spray or aerosol and have been linked with various infections including Legionnaires' disease.

Please note: the above identify the main high-risk sources susceptible to colonisation by Legionellae. It is therefore important to ensure that all operation and maintenance instructions contained within this document are adhered to. It will be the responsibility of designated personnel commissioning works on behalf of the university be they its employees or acting on its instruction, to observe and implement the necessary procedures for the control of Legionella within university buildings, including the production of a risk assessment and a Scheme of Control for the equipment.

ALL SPRAY AND AEROSOL PRODUCING WATER PLANT, WHETHER LISTED ABOVE OR NOT, HOULD BE IDENTIFIED, ASSESSED AND THE ASSESSMENT RECORDED.

Water Treatment Requirements

Treatment Regimes

To ensure that installations utilising water within university buildings are maintained to the requisite standards, a regime of water treatment will be adopted as required. This regime

must comply with the Approved Code of Practice and Guidance (L8) and the Control of Substances Hazardous to Health Regulations 2002 (as amended). Consideration must be given to the Department of Health's Report of the Expert Advisory Committee on Biocides when implementing water treatment, ensuring the requirements are fulfilled.

Independent Monitoring

Independent monitoring of any resultant treatment regimes by UKAS approved laboratories should be carried out at appropriate intervals.

Maintenance Procedures

Where the risk assessment indicates that there is a foreseeable risk, use of such equipment or systems leading to exposure should be avoided as far as is reasonably practicable. Where this is not reasonably practicable, there must be a written scheme for minimising the risk of exposure. It is vital that such a scheme be suitably detailed to enable it to be implemented and managed effectively.

The regime for minimising the risk of exposure will contain all relevant information relating to the plant or system as necessary. In particular it should comprise:

a) An up-to-date plan of the system showing layout, including any parts that may be temporarily out of use (a schematic plan is sufficient).
b) Details of correct and safe operation.
c) Precautions to be taken.

The following maintenance procedures will be adopted by Estate Development's duly appointed agents, in accordance with the WSP in University buildings on systems that are susceptible to colonisation by Legionellae:

• A comprehensive risk assessment must be carried out to identify those installations at risk

• It is a statutory requirement that full records are kept of all maintenance procedures carried out and that copies of the records are maintained in an accessible position on the site for routine inspection by authorised persons and statutory officers

• To ensure that the above procedures are carried out effectively, it will be necessary for up-to-date record drawings of the various installations to be included with the operating manuals, complete with manufacturers' information

• When carrying out maintenance procedures, cleaning/decontamination work etc. it will be necessary for operatives to ensure that adequate safety precautions are taken and that suitable personal protective equipment is utilised as required to comply with the Health and Safety at Work etc. Act 1974. The procedures laid down in Health and Safety Commission Guidance Note, the Approved Code of Practice and Guidance (L8) and BS6700 Specification for the Design, Installation, Testing and Maintenance of Services Supplying Water for Domestic Use within Buildings and their Curtilages must also be considered

• All Estate Development staff and Contractors employed by the university or its agents will be required to submit a copy of their Safety Procedures before undertaking any work activities on university water systems

• It is a requirement that all new building water systems and modifications to existing water distribution installations must comply with the design practices laid down in BS6700 and conform to the Water Regulations. All materials utilised in future installations must be constructed from materials that are approved by the Water Research Centre and identified in their water fittings and materials directory.

Preparation of an Implementation Plan, Maintenance and Records

Preparation of an Implementation Plan

On completion of the risk analysis survey, Estate Development's duly appointed agents will undertake the following in full consultation with the WQLCM:

a) Develop schemes for risk minimisation and control in order of priority giving consideration to cost, risk and resources

b) List all areas in priority order on a non-compliance and potential risk basis

c) Devise a management programme for the minimisation of risks so that an action plan identifying resources, costs and projected timescales can be drawn up

d) On receipt of approval to proposed costs, priority and timetable for implementation of the policy and associate procedures, the Water Systems Management Team will assist in the management of the programme and identify any compliance failures taking the necessary remedial action where required

f) Review the programme of the action plan at yearly intervals and record progress in implementing the work. All changes to the water systems and functional content shall be recorded and evaluated.

Maintenance and Care of Water Systems Equipment

All equipment located within the university premises that is either permanently or temporarily connected to building water systems has the potential to infect water systems or to discharge aerosols into the atmosphere. Additionally, equipment that has water in its system e.g. water coolers, dishwashers, electron microscopes etc. can also become sources of potential infection.

It is therefore important to ensure that persons wishing to deploy such equipment within the university buildings be required to consult the Water Quality and Legionella Control Manager and obtain consent for connection of the same to university water systems before purchase. Consent should only be given if the equipment is property certified for use in the prevailing site circumstances, installed by competent persons, is to be maintained in accordance with manufacturers' and regulatory requirements and is the subject of regular monitoring in accordance with the following regime:

a) The systems must be carefully designed so as to minimise aerosols and the material used in the construction shall not harbour or provide nutrient for bacteria. They must be designed to be readily drained and cleaned.

b) The systems must be regularly maintained in a clean and sound condition.

c) The water quality must be maintained by the use of appropriate agreed levels of water treatment, cleaning and disinfecting on a regular basis.

d) Careful monitoring of the precautions

Records must be kept of the maintenance performed and the results obtained.

Appendix 2

Monitoring and Actions for Different Scenarios

Monitoring Water Systems for Legionellae

All the following assume that the systems being examined have had a full risk assessment carried out on them previously and have been maintained since then in accordance with the recommendations as outlined in the appropriate ACOP L8 and HSG274 Parts 1,2 and

3. The reader is also reminded that:

1) There has never been an outbreak recorded to date that has been caused by a water system strictly maintained and managed in accordance with ACOP L8 and HSG274 Parts 1,2 and 3

2) Failure to comply with ACOP L8 and HSG274 Parts 1, 2 and 3 will result in an increased risk

3) No control measures can guarantee the elimination of Legionellae from a water system

Hot and Cold-Water Systems

These should only be examined for the presence of Legionella under the following circumstances:

1) Where there has been an outbreak or problem previously

2) To monitor the effectiveness of control measures taken in place of relying on the temperature regimes (hot water circulated at 60°C and delivered at least 50°C within at least 30 seconds for local return connections or within 1 minute of opening an outlet for subordinate loops; cold water delivered through an outlet below 20°C within 1 minute of opening an outlet)

3) For outbreak investigations

4) In high-risk areas

In all other situations, risk management and monitoring should be based on carefully monitoring temperatures and regular maintenance in accordance with ACOP L8 and HSG274 Parts 1, 2 and 3.

Actions to Be Taken in the Case of a Water Sample Giving a Positive Legionella Test Result (Legionella Bacteria CFU/Litre 100-1000 See Table Below)

Table 1: Action in response to Legionella counts in hot and cold-water systems

Legionella bacteria culture	**Recommended Actions**
>100 CFU/L and up to 1000	If the minority of samples are positive, the system should be resampled. If similar results are found again, a review of the control measures and risk assessment should be carried out to identify any remedial actions necessary or If the majority of samples are positive, the system may be colonised, albeit at a low level. An immediate review of the control measures and risk assessment should be carried out to identify any other remedial action required. Disinfection of the system should be considered
>1000 CFU/L	The system should be resampled and an immediate review of the control measures and risk assessment carried out to identify any remedial actions, including possible disinfection of the system. Retesting should take place a few days after disinfection and at frequent intervals afterwards until a satisfactory level of control is achieved.

Action 1

Estate Development's duly appointed agents will inform the WQLCM and/or the Deputy Responsible Person and the other members of the Water Systems Management Team.

Action 2

Estate Development's duly appointed agents, in conjunction with the WQLCM, will immediately make the necessary preparatory arrangements to carry out the recommendations from risk assessment including consideration of disinfection and or pasteurisation of the relevant water system.

Action 3

The Deputy Responsible Person will convene/chair a meeting to consider the urgency and extent of the action to be taken. Included in the meeting will be:

Water Systems Management Team members: Responsible Person; Deputy Responsible Person; Water Quality and Legionella Control Manager; Health and Safety Adviser and Estate Development's duly appointed agents.

Action 4

Undertake remedial action as described in the section within ACOP L8 and HSG274 detailing Cleaning and Disinfection Procedures and required by the risk assessment carried out following positive count. Estate Development's duly appointed agents, in conjunction with the WQLCM, or an appointed specialist should supervise remedial actions. If there is any doubt whatever about how to achieve the eradication, specialist assistance must be sought.

Action 5

Further samples will be taken as directed by the risk assessment and Water Systems Management Team.

Action to Be Taken in the Event f a Suspected of Microbiologically Diagnosed Case of Legionnaires' Disease in a Person at Liverpool John Moores University

Action 1

The Responsible Person will convene the Business Continuity Operations Group co-opting any support deemed necessary from the Water Systems Management Team to discuss the case immediately. Any enquiry directed to the alleged patient and the patient's treating doctors will be undertaken by the University Occupational Health Unit in accordance with the General Data Protection Regulation and the rules of medical confidentiality. This enquiry will be aimed at confirming the diagnosis, especially serotypes of the alleged pathogen and time sequence of symptoms, exposure and treatment, with a view to establishing whether the condition could have been linked to the working environment.

Action 2

The Water Systems Management Team will review the suspected location/source of infection and, in conjunction with the Water Quality and Legionella Control Manager, will arrange a review of any relevant water systems monitoring records and arrange sampling.

Action 3

Measures may be taken by Estate Development's duly appointed agents and appointed contractors at this stage to reduce exposure of any other susceptible persons.

Action 4

The Water Systems Management Team will review the water sampling results and decide what further actions need to be taken with advice from the independent Water Systems Consultant and the relevant external agencies.

Local Authority Action in Event of an Outbreak

The action in the event of an outbreak detailed below is taken directly from HSG274 Part 2 Appendix 2.3 and details the process that is followed by the Local Authorities when an outbreak is confirmed.

1) In England and Wales, Legionnaires' Disease is notifiable under the Health Protection (Notification) Regulations 2010 and in Scotland under the Public Health (Notification of Infectious Diseases) (Scotland) Regulations 1988. Under these Regulations, human diagnostic laboratories must notify UK Health Security Agency, Public Health Wales (PHW) or Health Protection Scotland (HPS) (see 'Further sources of advice') of microbiologically confirmed cases of Legionnaires' Disease.

2) An outbreak is defined as two or more cases where the onset of illness is closely linked in time (weeks rather than months) and where there is epidemiological evidence of a common source of infection, with or without microbiological evidence. An incident/outbreak control team should always be convened to investigate outbreaks. It is the responsibility of the Proper Officer to declare an outbreak. The Proper Officer, appointed by the Local Authority, is usually a Consultant in Communicable Diseases Control (CCDC) in England and Wales, or the Consultant in Public Health Medicine (CPHM) in Scotland. If there are suspected cases of the disease, medical practitioners must notify the Proper Officer in the relevant local authority.

3) Local Authorities will have jointly established incident plans to investigate major outbreaks of infectious diseases, including Legionellosis, and it is the Proper Officer who activates these and invokes an Outbreak Committee, whose primary purpose is to protect public health and prevent further infection.

4) HSE or local Environmental Health Officers may be involved in the investigation of outbreaks, their aim being to pursue compliance with health and safety legislation. The local authority, Proper Officer or EHO acting on their behalf will make a visit for public health reasons, often with the relevant officer from the enforcing authorities (i.e. HSE or the local authority) for health and safety reasons. Any infringements of relevant legislation may be subject to a formal investigation by the appropriate enforcing authority.

5) There are published guidelines (by PHE, PHW and HPS) for the investigation and management of incidents, clusters, and outbreaks of Legionnaires' disease in the community. These are, for England and Wales, Guidance on the Control and Prevention of Legionnaires' disease in England and for Scotland, Guidelines on Management of Legionella Incidents, Outbreaks and Clusters in the Community.

6) If a water system is implicated in an outbreak of Legionnaires' Disease, emergency treatment of that system should be carried out as soon as possible. This will usually involve the processes detailed in paragraphs 2.124–2.135 of HSG274. As part of the outbreak investigation and control, the following requests and recommendations may be made by the enforcing authority:

(a) To shut down any processes which are capable of generating and disseminating airborne water droplets and keep them shut down until sampling procedures and any remedial cleaning or other work has been done. Final clearance to restart the system may be required.

(b) To take water samples from the system before any emergency disinfection being undertaken. This will help the investigation of the cause of the illness. The investigating officers from the local authority/ies may take samples or require them to be taken.

(c) To provide staff health records to discern whether there are any further undiagnosed cases of illness and to help prepare case histories of the people affected.

(d) To co-operate fully in an investigation of any plant that may be suspected of being involved in the cause of the outbreak. This may involve, for example:

(i) tracing of all pipework runs

(ii) detailed scrutiny of all operational records

(iii) statements from plant operatives and managers

(iv) statements from water treatment contractors or consultants

Any infringements of relevant legislation may be subject to a formal investigation by the appropriate enforcing authority.

Emergency Cleaning and Disinfection Procedure for Cooling Towers

1) If a cooling water system has been implicated in an outbreak of Legionnaires' Disease emergency cleaning of that system has to take place as soon as possible. The following actions should be taken, where appropriate:

(a) Switch off the fan immediately

(b) Take samples for laboratory investigation before any further action

(c) Switch off the circulation pump as soon as is practicable and decommission the system

(d) Consult the enforcing authority before proceeding further

(e) Keep all personnel clear of the tower area

(f) When cleared by the enforcing authority, add sodium hypochlorite to the system water to obtain a measured concentration of 50 mg/l of free chlorine

(g) Circulate the system water with the fans off for a period of at least six hours

(h) Maintain the free chlorine level at an absolute minimum of 20 mg/l at all times

(i) Use a suitable biodispersant

(j) After six hours, de-chlorinate and drain the system

(k) Undertake manual cleaning of the tower, sump and distribution system with cleaning staff wearing fully pressurised respirators

(l) Refill with fresh water, add sodium hypochlorite

(m) Recirculate without using the fan, at 20 mg/l of free available chlorine for six hours

(n) De-chlorinate and drain the system

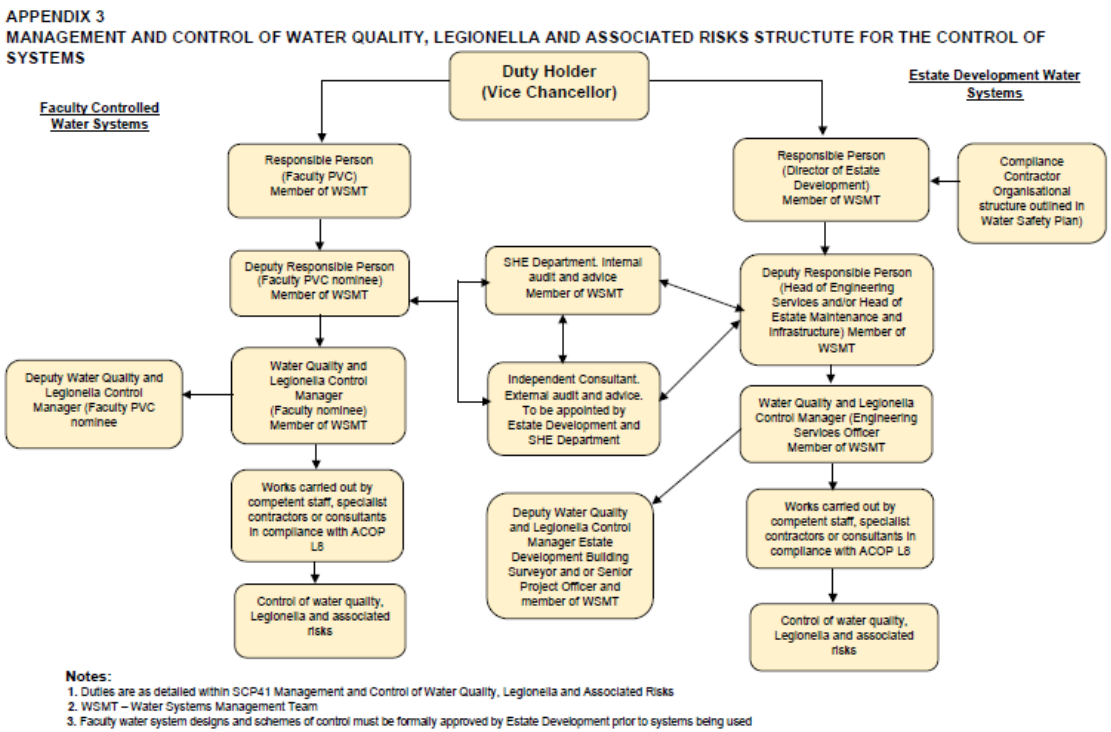
(o) Refill, re-circulate and take samples for testing

(p) Re-commission the system when test results detect no legionella and/or permission is granted by the enforcing authority

2) If a water system other than a cooling system is implicated in an outbreak of Legionnaires' disease, emergency treatment of that system should be carried out as soon as possible.

Appendix 3

Management Structure for the Control of Systems (Flow Chart)



END OF POLICY