



HEALTH & SAFETY SERVICES

HEALTH AND SAFETY ARRANGEMENTS

Legionella Management Plan

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1.0 INTRODUCTION

1.1 Background Information

- 1.1.1 Legionellosis is the term used for infections caused by bacteria of the genus *Legionella*. The most serious of these diseases is Legionnaires' disease. This is a severe form of pneumonia with a moderately high fatality rate. This form of pneumonia was first identified following a large outbreak of pneumonia among the attendees of an American Legion Convention in Philadelphia in 1976 and a previously unknown bacterium was identified. This bacterium was named *Legionella Pneumophila*. To date there are at least 40 forms of legionella bacteria which have been identified, however *Legionella Pneumophila* accounts for approximately 90% of all reported cases of legionellosis and is the principal cause of Legionnaires' disease.
- 1.1.2 *Legionella* bacteria are naturally occurring and can be found in environmental water sources such as rivers and lakes. The bacteria can survive under a range of temperatures, typically between 20°C and 45°C. However, below 20°C bacteria are dormant and are able to multiply when water temperatures increase. Thermal inactivation of *Legionella* bacteria starts in water of approximately 50°C. Water temperatures of 60°C have been found to destroy 90% of *Legionella Pneumophila* within approximately 2 minutes. The preference of legionella bacteria for warm water often means that bacteria are capable of colonising artificial water sources and equipment containing water.
- 1.1.3 Legionellosis is usually contracted via the inhalation of aerosol contaminated with legionella bacteria. However, the individual has to be susceptible for infection. Studies have shown that only a small number (approximately 5%) of those exposed to the bacteria develop the disease. However, increasing age (particularly over 50 years old), smoking, being male and being immunosuppressed increases an individual's susceptibility.
- 1.1.4 A number of factors are therefore required in order to create a risk of acquiring legionellosis:
- The presence of legionella bacteria.
 - Conditions suitable for multiplication of the bacteria. This would include nutrient source such as debris, sediment, sludge, corrosion deposits, slow moving water and a suitable temperature (between 20°C and 45°C).
 - The means of creating and disseminating an aerosol.
 - The presence of individuals who may be exposed to the aerosol.
 - The presence of individuals who are susceptible to contracting legionellosis e.g. immunosuppressed.
 - Smokers.
 - Those over 50 years of age.

1.2 Overview

- 1.2.1 The university has a duty with respect to legionella under the Health and Safety at Work etc. Act 1974, COSHH regulations and Management of Health and Safety at Work regulations to consider the risks that may affect its staff, students, visitors and members of the public and take suitable managed precautions. To this end, the university has commissioned comprehensive legionella risk assessments throughout all the buildings for which the university is the duty holder and has maintenance responsibility. These risk assessments have been performed by an independent consultancy in accordance with the HSE's Approved Code of Practice (ACoP) and Guidance document: 'Legionnaires' Disease: The control of legionella bacteria in water systems', henceforth referred to in this plan as L8 and HSG274.
- 1.2.2 The majority of water systems within the university's Estate are classed as 'domestic' water systems i.e. they incorporate hot and cold-water systems. However, there are a range of other risk systems which have been identified such as humidifiers, and rainwater harvesting systems. There are no evaporative condensers or cooling towers within the Estate, with cooling provided by dry systems that pose minimal risk of legionellosis.
- 1.2.3 Where the legionella risk assessments have shown that there is a reasonably foreseeable risk of exposure to legionella in a property, this document is to be followed to satisfy the requirements of the written scheme as laid out in L8 and HSG274. This management plan details the control measures and processes which are utilised within the university for the control of legionella and makes specific references to the monitoring and review actions which will be taken in order to ensure that the written scheme remains effective, and the water systems remain in control with respect to the proliferation of legionella bacteria. Documentation relating to the legionellosis preventative regime for a building will be held within the e-logbook, together with this document the university aims to fulfil the requirements of a written scheme.
- 1.2.4 All legionella risk assessments are regularly reviewed (please see section 4.4) and remedial actions are taken in view of the recommendations given by these assessments. These suitable and sufficient legionella risk assessments are used in the formation of appropriate control measures for each building; these control measures are put in place to protect the health and safety of staff, students, visitors and members of the public who could be affected by work activities. The E-logbook is accessible from any computer with an internet connection by users holding login credentials. It is utilised by approved persons within Estates and Facilities, Health and Safety Services, and KCL appointed legionella consultants and nominated water treatment contractor to record all tasks/checks/inspections for each building that are performed as part of the scheme.

1.3 Objectives

- 1.3.1 King's College London as a responsible employer, owner and controller of premises is aware of its legal duties owed to staff, students, building occupiers, contractors and others concerning the provision of safety related information of the control of legionella bacteria within the hot and cold-water systems of the premises.

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1.3.2 This plan has been developed, in part, to fulfil the requirements and obligations under current legislation and to provide the means from which exposure to legionella bacteria can be prevented. This will involve the combined efforts of all parties (i.e. management, staff, students, maintenance, contractors etc.).

1.3.3 It is the university's intention to manage all its operations with regard to the design and maintenance of domestic water systems and air handling systems, in compliance with all current and relevant guidelines and legislation. The university's recommended standards given in this Management Plan have been prepared on the interpretation, understanding and practical applications of the legal requirements in conjunction with L8. This is to ensure that the likelihood of exposure to staff, students, visitors and others to legionella bacteria is so far as is reasonably practicable, removed. The principles behind this Legionella Management Plan are:

- To strive to eliminate the risk of legionella associated with various water systems where reasonably practicable.
- To consider substitution of a lower risk water system as far as reasonably practicable where elimination is not possible.
- To take reasonable and practical precautions to manage and control legionella bacteria within the water systems.
- To protect the people occupying and visiting their premises, as well as passers-by within the vicinity of the premises.
- To ensure that appropriately trained and technically competent and experienced staff are available and resourced to manage adequately the water systems and associated legionella control.
- To control exposure to legionella bacteria by ensuring that all contractors and sub-contractors identify appropriate risk assessments and safe working practices.
- King's College London employees, authorised to work on the water systems, will be managed in accordance with this plan and will possess specific expertise and competency.
- To ensure the procedure for the control of Legionella bacteria in water systems, plant and equipment with the university's properties shall be in accordance with the ACoP L8 and HSG274.
- To validate adequately any control measures to ensure effectiveness.

1.4 **Scope**

1.4.1 This document, in conjunction with Estates & Facilities' Legionella Written Control Scheme documents provides information, procedures and guidance relevant to the management and control of legionella bacteria within the buildings and embedded spaces for which the university is the duty holder.

1.4.2 The management plan applies to all areas of King's College London without exception. It is designed to be a dynamic document that will be updated as the university's procedures, or

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regulatory requirements change. It considers all existing regulations and guidance documents pursuant to the control of legionella.

1.4.3 To enable the duty holder to discharge his responsibility this document describes the requirements and procedures for controlling the proliferation of legionella bacteria.

1.4.4 These procedures cover:

- Ensuring that a suitable and sufficient legionella risk assessment is in place for all buildings domestic and other risk systems which the university has responsibility.
- Ensuring that the improvement actions highlighted in the risk assessment are acknowledged and address in a timely manner in accordance with the timeframes set by the legionella consultant.
- The appointment of the Estates Safety & Compliance Team.
- The written appointment of responsible persons for each water system identified
- Ensuring that a written control scheme is in place for each campus giving coverage for all properties.
- Ensuring that the measures taken to ensure that the preventative regime is being suitably implemented and that the control measures are remaining effective.
- Ensuring that the legionella risk assessment is regularly reviewed.
- The promotion of legionella awareness and the Legionella Management Plan through training and induction of staff, maintenance and contractors etc.
- The review of the Legionella Management Plan and procedures

NHS Trust Embedded Space

1.4.5 The university has an obligation to ensure that its staff are afforded protection from hazards whilst undertaking their work, and to this part, the university will seek assurances and verification from the appropriate NHS Trust to ensure that they are in possession of a full legionella risk assessment and a site-specific legionellosis preventative regime for each premises. Where applicable, the university will undertake legionella risk assessments and implement a legionellosis preventative regime for the areas of these buildings for which it has responsibility. Trust/KCL patient occupied areas will meet HTM requirements.

1.4.6 Out of specification results or risk issues identified by either KCL, contractors or GSTT will be communicated to the relevant parties. KCL is represented at the GSTT water safety group which meets every other month to discuss out of specification results and potential risks in regard to legionella.

1.4.7 Periodic reviews are to be conducted by Estates Safety & Compliance, with further information provided in Section 6.7.

Public Private Partnership (PPP)/Private Finance Initiative (PFI) Buildings

- 1.4.8 The university has an obligation to ensure that its employees are afforded protection from hazards whilst undertaking their work. The university will seek assurances and verification from the appropriate PPP operated building that they are in possession of a full legionella risk assessment and that a site-specific legionellosis preventative regime is in place for each premises.
- 1.4.9 Periodic reviews are to be conducted by Estates Safety & Compliance; further information is provided in Section 6.7.

1.5 Review

- 1.5.1 This Management Plan will be reviewed regularly or when legislation changes on a regular basis or if there is reason to suspect that if it is no longer valid, the policies within this document will be reviewed by a group comprising:

- Estates & Facilities Safety & Compliance (Head of Technical Compliance)
- Health and Safety Services
- Other key stakeholders by invitation.

This can be included within other operational meetings.

Regular operational review meetings (to include contract review meetings) will also be held. These meetings will comprise of, as required:

- Estates & Facilities Safety & Compliance
- Health and Safety Services
- Lead Engineers or Maintenance Managers (including managers representing Sports grounds and Residences) or their nominated deputies.
- Head of Engineering
- Legionella Consultant
- Water Treatment Contractor's Contract Manager

2.0 LEGIONELLA MANAGEMENT PLAN



Figure 1 – Elements of the Legionella Management Plan

2.1 References and related documents

- 2.1.1 Legislation governing the control of legionella bacteria has been introduced via a series of regulations made under the enabling act, The Health and Safety and Work etc. Act 1974. The principle of this act is to assess hazards and risks and then take precautions to minimise this risk. The university has a duty to all employees, users of its buildings and the public who may be affected by work or maintenance activity.
- 2.1.2 The university's recommended standards given in this Management Plan have been prepared on the interpretation, understanding and practical applications of the current versions of the relevant statutory documents and guidance documents which can be found in the references section at the end of this document.

2.2 Definitions

- 2.2.1 In this management plan, the following definitions apply:
- "The university" means King's College London
 - "Contractor" means anyone the university employs to do work of any kind who is not an employee.
 - "Duty Holder" mean the individual with the legal responsibility to ensure that health and safety is managed effectively.

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- NOTE 1: The duty holder is the employer where the risk is from their undertakings to their staff or others. The self-employed person where the risk is from undertaking to themselves or others. Alternatively, the person in control of the premises where the risk is present from the systems in the building (e.g. a property owner who remains responsible for the maintenance of the systems). See ACOP L8 para 28.
- NOTE 2: In most cases, there will only be one duty holder, but in cases of shared accommodation, there could be a shared responsibility. The duty holder cannot delegate this duty but can delegate managerial responsibility to the Responsible Person.
- “Appointed Responsible Person” is an individual appointed with, and who has responsibility under, the authority of the duty holder for ensuring that the organisation’s responsibilities for the control of legionella are met and that all individuals and organisations assigned to carry out tasks in the written control scheme are competent to do so.
- “Competent Person” refers to all persons who are suitably informed, instructed and trained with their suitability assessed in relation to ensuring that their assigned tasks are performed in a safe and technically competent manner. Training is viewed by the HSE as a combination of sufficient training, experience, knowledge and other qualities that are needed.
- “HSE” means the Health and Safety Executive.
- “ACoP” means Approved Code of Practice and Guidance. The HSE issue ACoPs that give guidance on how to comply with the regulations to which it applies. Following an ACoP is not mandatory, but in a court of law, failure to adopt the advice in an ACoP will be regarded as having failed to comply with the law unless the defendant can prove they have complied by equivalent means.
- “Hot water storage vessel” means an apparatus used for the transfer of heat to water in a vessel, the source of heat being contained within a pipe or coil immersed in the water.
- “Dead-leg” is the pipework leading to an infrequently/or little used outlet.
- “Dead-end” is a length of pipework that has been cut off and doesn’t supply any outlets.
- “Legionella Risk Assessment” is the process of identifying and evaluating the risk of exposure to legionella bacteria from work activities and from water systems or equipment.
- “L8” is the Approved Code of Practice document “Legionnaires’ Disease: The control of legionella bacteria in water systems”.
- “Sentinel” outlets/sample points are considered the first and last taps on each recirculating hot loop. For cold, mains and non-recirculating loops the nearest and furthest taps from the tank, storage vessel or incoming supply on each branch are to be used in conjunction the guidance in paragraphs 2.59, 2.62 – 2.64 of HSG274 Part 2 with particular reference to the identification of subordinate and tertiary loops for monitoring.

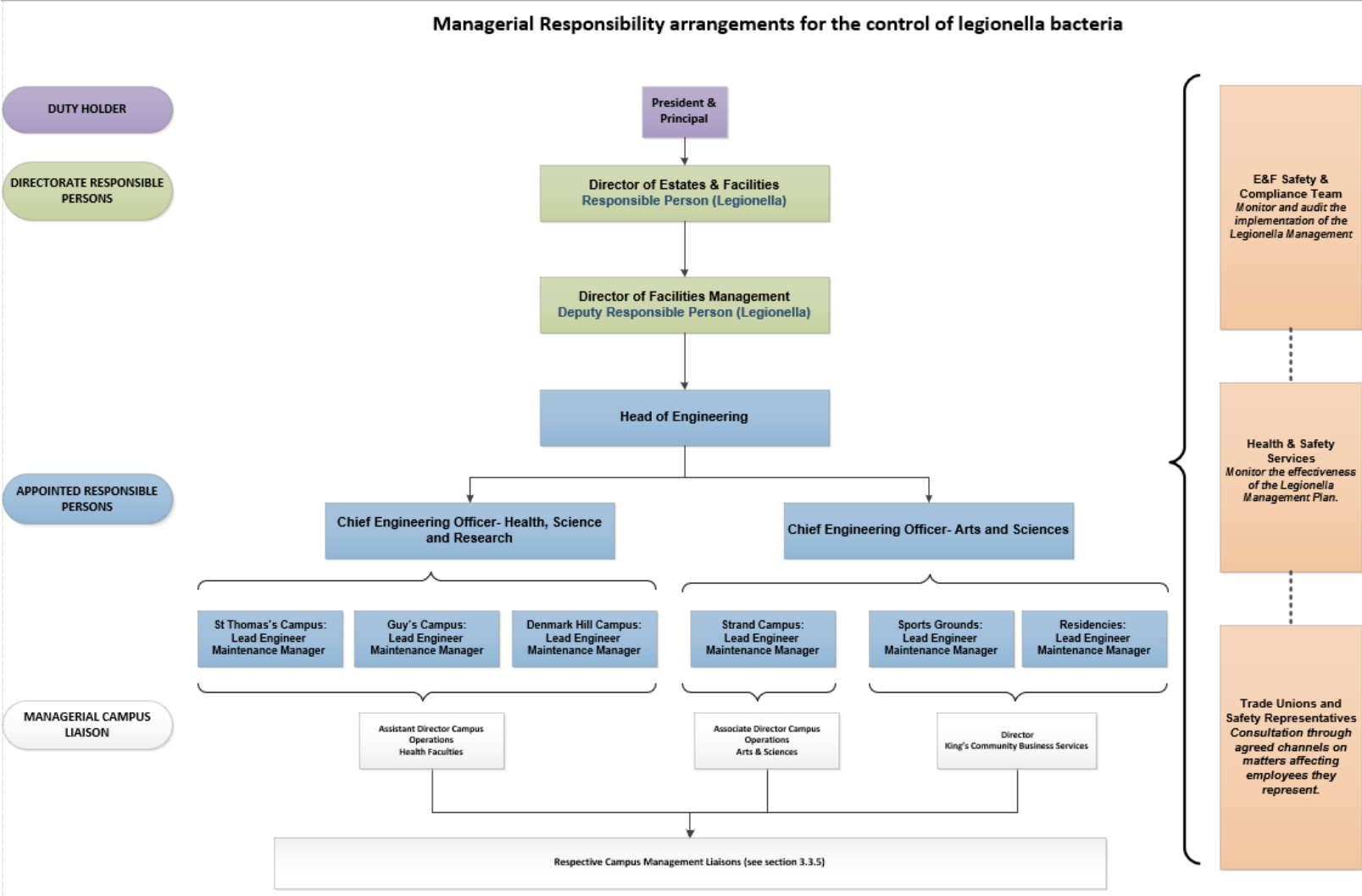
3.0 MANAGING PEOPLE

3.1 General

- 3.1.1 The university will appoint suitably qualified and competent staff to discharge the responsibilities concerning legionella. This section identifies the responsibilities for the control of legionella throughout the university.
- 3.1.2 This Legionella Management Plan is designed in such a way to integrate into the existing King's College London maintenance and operations programmes.
- 3.1.3 The following key personnel in the organisational chart [Section 3.2](#) will be responsible for the implementation of the control measures discussed in this document and their responsibilities are expanded in [Section 3.3](#):

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3.2 Organisation Chart



3.3 Appointments, roles and responsibilities

3.3.1 Tasks relating to legionella management may be delegated but the accountability may not.

Duty Holders

3.3.2 The university's senior management organisation chart is documented on the [King's webpages](#).

College Council

- The university commitment to promoting a healthy and safe working environment.

Principal and President

- Assigned Duty Holder to ensure university wide compliance with and implementation of the Legionella Management Plan
- Approval of the Legionella Management Plan

Senior Vice President (Operations)

- Allocate funding to ensure that the Legionella Management Plan is followed.
- Overall responsibility for the university and is responsible for the overall strategic legionella management including procedures and practices.
- Ensuring the development and implementation of the Legionella Management Plan.

Directorate Responsible Person (Legionella)

3.3.3 The Director of Estates & Facilities has overall responsibility for strategic legionella management including procedures and practices. Ensuring development and implementation of the LMP that includes: -

- Appointed by the Senior Vice President (Operations) to implement strategic legionella management including procedures and practices.
- Commissioning and implementing this plan and the legionella action plan.
- Responsibility for the appointment of persons to act as the appointed "Responsible Person" for the buildings and premises under their control.
- Conduct and/or otherwise allocate the approved consultant or other competent persons, the task of providing detailed technical specifications and management services (including the provision of consultancy services and expert witnesses) for scheduled or emergency works.
- Evaluate on an annual basis (or more frequently if required), the need to hold refresher training for all newly employed staff members whose job requires them to manage water systems/building infrastructure or if their job requires them to perform tasks required under the legionellosis written control scheme. [The Estates and Facilities Training Matrix](#) located

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in Table 1 has been developed to highlight the training requirements and frequency of refresher training for staff and contractors involved in the legionella management programme.

- Commission or provide awareness and/or procedural training for all university staff (including agency and contract staff under direct control) whose job requires them to manage water systems/building infrastructure. Alternatively, if their job requires them to perform tasks required under the legionellosis written control scheme.
- Commission an annual review of the legionellosis written control scheme for each building to assess its effectiveness (part of the legionella risk assessment).
- Monitor the implementation of the Legionella Management Plan.
- Carry out an annual review of the Legionella Management Plan to review critically all the management processes and their effectiveness as well as the overall progress made against the implementation of the written control scheme.

Directorate Deputy Responsible Person (Legionella)

3.3.4 The Director of Facilities Management, as Deputy Responsible Person (Legionella), responsibilities include: -

- Acts on behalf of the Responsible Person (Legionella) in respect of this LMP

Appointed Responsible Person (Legionella)

3.3.5 The Head of Engineering is appointed as the Responsible Person with the Chief Engineering Officers deputising for their respective service areas. The Lead Engineers, Maintenance Managers, Assistant Maintenance Managers/Team Leaders and Senior Maintenance Technicians at the local level will assist the Chief Engineering Officers. Their responsibilities include: -

- Appointed as the Responsible Person.
- Ensuring that the recommendations given in the legionella risk assessments are completed in a timely and effective manner with suitable records kept.
- Ensure that a copy of all legionella risk assessments and logbook records are made available to whosoever wishes to inspect such records.
- Ensuring that the tasks outlined in the legionella preventative regime are performed and suitably recorded.
- Co-ordinate the response to any out of specification/elevated biological test results within the premises. This will include the evaluation of circumstances under which legionella may have been encountered. Initiating any remedial actions and re-sampling liaising with the Estates Safety & Compliance team, Director of Facilities Management and Managerial Campus Liaisons in respect of the above.
- Overseeing the completion and recording of any remedial actions performed in light of out of specification results (including legionella detections) obtained as part of the legionellosis preventative regime.

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- Notifying the Estates Safety & Compliance Team prior to any changes in the written control scheme and/or changes to the water system including changes in use/occupancy of a building and ensuring correct university procedures including those for new technologies and change control are followed.
- Ensuring all logbooks and associated records are up-to-date and audited on a regular basis.
- Ensuring that the current legionella risk assessment is available for inspection (either hard copy or electronic).
- Ensuring adequate staffing levels to perform tasks in accordance with this legionella management plan (appendix 1).

Estates & Facilities Campus Liaisons

Director of King's Community Business Services, Associate/Assistant Directors of

Campus Operations, King's Residences, King's Food & King's Sports

- To co-operate and be the main point of liaison with the Managerial Responsible Person to ensure that information is effectively communicated to the building users in the event of out of specification results being obtained as part of the written control scheme checks and inspections and the completion of remedial works. This would include the availability of facilities whilst remedial works are undertaken
- General awareness of the status of the written control scheme tasks to provide assurance that the domestic water system is being effectively maintained.

Estates & Facilities Safety & Compliance Team

Head of Technical Compliance

- Monitor the implementation of the Legionella Management Plan.
- Carry out an annual review of the Legionella Management Plan to review critically all the management processes and their effectiveness as well as the overall progress made against the implementation of the written control scheme.
- Day to day management of the Technical Compliance –Legionella.

Technical Compliance Manager – Legionella

- Perform regular reviews of the global water management documentation and water logbooks for representative properties.
- Perform regular review on the water systems within representative buildings.
- Ensure that copies of all legionella risk assessments are uploaded to the electronic digital university systems. Water logbook records to be uploaded as required.

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- Liaising with the campus maintenance teams and appointed responsible person on the outcomes of issued risk assessments including improvement actions, and key findings identified by the legionella consultants.
- Liaising with the Lead Engineers, Maintenance Managers & nominated assistants/deputies in respect of the response to any out of specification/elevated biological test results.

Estates & Facilities

Asset Maintenance Staff

- Performing tasks allocated under the legionellosis preventative regime (as detailed in tables 2 and 3 of this plan) and logging all results.
- Ensure that any works performed on the domestic water and closed water systems are performed in a safe manner in accordance with this plan.
- Reporting to the Maintenance Managers any defects or out of specification results.
- Response to remedial action requests e.g. service desk requests, emergency isolations and recommissioning works.

Asset Improvement & Capital Projects Staff

- Following this LMP and reporting all alterations to the domestic water systems (including additions and removals) to the Maintenance team.

Contractors, Consultants & Service Providers

- Complying with the university's legionella management plan and any associated procedures.
- Undertaking Estates and Facilities contractor induction

Legionella Consultants and Water Treatment Contractors

Legionella Consultant (LC)

- Performing legionella risk assessments in accordance with L8 on all buildings.
- Reporting any defects or non-compliances relating to the legionella written control scheme or water services under the responsibility of KCL to the Lead Engineer, Maintenance Manager and Estates Safety & Compliance Team
- Providing expert witness and consultancy services on an ad hoc basis.
- Suitable arrangements to deal with call-outs within contract specification.

Water Treatment Contractor (WTC)

- Performing tasks under the legionellosis preventative regime as dictated by the legionella risk assessment.

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- Performing tasks allocated under the legionellosis preventative regime (as detailed in tables 2 and 3 of this plan) and logging all results.
- Notifying the Lead Engineer, Maintenance Manager and Estates Safety & Compliance Team of any remedial works or out of specification results.
- Ensuring that all tasks/checks performed are suitably logged.
- Providing expert witness services on an ad hoc basis.
- Ensuring adequate staffing levels to perform tasks in accordance with this legionella management plan and the contract.
- Suitable arrangements to deal with call-outs within contract specification.

Health and Safety Services

- Liaise with the university duty holder and responsible persons above as necessary.
- Monitoring and auditing of the effectiveness of this plan.
- Correspondence with the enforcing agency as required.

3.4 Information, instruction, training and competence for King's staff

- 3.4.1 King's College London has a duty to ensure that any person who carries out tasks or maintenance on the water systems is competent. This duty also extends to consultants and contractors who work on the systems. King's College London recognises that competence is derived from a combination of suitable information, instruction and training in relation to a specific task. Competence for all directly employed labour, consultants and contractors will be assessed in this way.
- 3.4.2 General training for university employees is detailed in: [SPR-035 - Safety Information, Instruction, Training and Supervision in King's College London](#)
- 3.4.3 Competent persons with the correct level of technical knowledge should only carry out accident investigations. To this end, the university requires such staff to meet the following criteria:
- Attended the [Health & Safety Services \(H&SS\) accident reporting and investigation training module](#).
 - Evidence of equivalent training
- 3.4.4 All health and safety legislation stress the importance of communication/instruction and training and L8 guidance is no exception. It is the policy of King's College London to ensure that all persons involved with the legionellosis preventative regime are in receipt of suitable training and that this training is regularly reviewed, and observations performed by the King's College London Estates Safety & Compliance Team and representatives from Engineering on the tasks completed and the documentation evidencing this works. Competency of contractors will also be assessed with periodic site audits, with further information provided in section 6.7.
- 3.4.5 The Director of Estates & Facilities shall provide or arrange for legionella awareness and procedural training for all employees involved with the written control scheme. In addition,

comprehensive training will be provided for supervisory staff, responsible persons and those undertaking the tasks prescribed in the scheme. For each case, training will be individually tailored to address the specific needs of the training group and shall be based on current legislation and information regarding the control of legionella at the time of the training session.

- 3.4.6 Training analysis will also form part of the risk assessments and regular internal audits. At this time personnel involved with the legionella written control scheme will be sampled for certification and on-site knowledge (via auditing of the logbooks and observation of onsite procedures).
- 3.4.7 Assessment of competence and understanding of current training records and further training requirements of new staff is to be completed during the recruitment phase. This will ensure the level of competence and the need for further training / supervision if required has been considered before persons are employed to complete the required tasks.
- 3.4.8 Refresher training will be performed at least on a three-yearly basis for all staff.
- 3.4.9 The structure of the courses will include:

Legionella Awareness

- Background to Legionellosis and legionella bacteria including the signs and symptoms of the diseases and the methods of transmission.
- A brief epidemiology of the bacteria including conditions which allow the bacteria to develop.
- Overview as to how the proliferation of legionella bacteria is controlled within buildings at King's College.
- Necessary information on safe water system management and maintenance to ensure that control measures and monitoring practices are correctly implemented.

Advanced Legionella Awareness

- 3.4.10 In addition to the Basic Legionella Awareness training above:
- Further explanation of the current ACoP L8 and details/methods of testing for the tasks required under the scheme.
 - Written control scheme tasks/checks required for properties under both temperature control and biocide control.
 - Record keeping and the importance of correct and accurate documentation of results.
 - Advised remedial actions to be taken in the event of out of specification results to be communicated, particularly concerning legionella detection, reduced hot water storage/delivery temperatures, chlorine dioxide leakages, and elevated/reduced chlorine dioxide levels.
 - Duty holder responsibilities for those in managerial roles according to this water management plan and [King's Health, Safety and Wellbeing Policy Statement](#).

Other risk systems

- 3.4.11 Where other risk systems that pose a legionellosis risk or other methods of legionella control are in use, specialist training will be provided for all individuals involved with the management, implementation and recording of the scheme. Deputies for all persons attending the training will be nominated and will receive specialist training so that cover can be maintained during periods of annual leave or in the event of staffing changes. The necessary training requirements will also be discussed with the Legionella consultant to identify if this training is the most relevant available in the industry.

3.5 Legionella Consultants and Water Treatment Contractors

- 3.5.1 King's College London enter into long term partnerships with contractors and consultants to ensure the requirements of HSE guidance (L8 or equivalent) and the management plan are adhered to, the competence of these partners is assessed and evaluated at the contract tender stages.
- 3.5.2 **Membership of the Legionella Control Association (LCA):** All companies who are members of the LCA have a commitment to ensure that their staff are competent to perform their duties. LCA membership is available for both water treatment contractors and consultants
- 3.5.3 **References:** Contractors and consultants will be requested to provide names and contact details from past clients, for newly employed directly employed labour former line managers can be contacted. Information gained can be used to demonstrate an element of competence.

Consultants

- 3.5.4 **Training certification for the Legionella Consultant** will also be requested upon awarding of the contract, a recognised qualification in legionella risk assessment must be held along with documented experience and knowledge of water systems for personnel employed to conduct the legionella risk assessments. It is expected that all consultants performing legionella risk assessments on the university's properties will have at least three years documented experience in performing legionella risk assessments and have attained suitable qualifications e.g. BOHS Proficiency Modules, or City & Guilds training. Full individual membership of the Water Management Society is also desirable.

Water Treatment Contractors

- 3.5.5 **The Water Treatment Contractor must have up to date membership of the Legionella Control Association.** Copies of membership certification and Training Matrices for staff involved with the contract will be requested by the university upon awarding of the contract, and in the event of staffing changes by the Water Treatment Contractor. Competence of contractors will be checked via contract compliance checks and continually gauged via the regular audits performed by the Estates Safety & Compliance Team on the contract documentation.

3.6 Competency Matrix

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- 3.6.1 Competence is defined as a combination of skills, qualifications, knowledge, training and experience sufficient to allow a person to be capable of performing their role effectively. Any one of these alone is unlikely to be sufficient to identify a person as competent. The matrix in [Table 1](#) is designed to assist with the identification of the health and safety training needs analysis for those working on domestic water systems or overseeing/managing the legionella preventative regime (see also [Section 3.2](#)).

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Table 1 - Estates and Facilities Training Matrix

	Mandatory		Mandatory where relevant to role		Desirable				
Competency matrix with respect to legionella management.	Advanced Legionella Awareness – Every 3 years	Legionella Awareness – Every 3 years	Legionella for Project Managers Awareness – Every 3 years	Professional competency as per 3.5.4 - consultants	Professional competency as per 3.5.5.– WTC Contractor	HSSSTM08 - Health & Safety for Managers and supervisors	HSSSTM04 - Accident Investigation	HSSSTM09 - General Risk Assessments	Company H&S training as per contract requirements
Directorate Responsible Persons (Legionella)									
Deputy Directorate Responsible Persons (Legionella)									
Appointed Responsible Persons (Legionella)									
Deputy Appointed Responsible Persons (Legionella)									
Estates & Facilities Head of Technical Compliance & Technical Compliance Manager (Legionella)									
Legionella Consultant									
Water Treatment Contractor									
Capital Projects - Directors									
Capital Projects - Project Managers									
Asset Maintenance – Lead Engineers, Managers, Assistant Managers, Team Leaders & Senior Maintenance Technicians/ Assistants									
Asset Improvement Managers									
Asset Maintenance – Maintenance Technicians, Maintenance Assistants									

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Competency matrix with respect to legionella management.	Advanced Legionella Awareness – Every 3 years	Legionella Awareness – Every 3 years	Legionella for Project Managers Awareness – Every 3 years	Professional competency as per 3.5.4 - consultants	Professional competency as per 3.5.5.– WTC Contractor	HSSSTM08 - Health & Safety for Managers and supervisors	HSSSTM04 - Accident Investigation	HSSSTM09 - General Risk Assessments	Company H&S training as per contract requirements
Associate/Assistant Directors of Campus Operations									
Campus Operations – GSTT Liaison/PFI Managers									
Residencies – Managers & Supervisors									
King's College London Contractors (e.g. MTC etc.)		¹							

Others

- 3.6.2 The competency requirements required for non-Estates and Facilities staff must be determined using the Competency Matrix above in conjunction with the individual's role requirements.

¹ Evidence of legionella awareness training, or equivalent, through the contractor's own company training programmes will be acceptable.

4.0 IDENTIFICATION AND ASSESSMENT OF RISK

4.1 Legionella Risk Assessment

- 4.1.1 The ACoP L8 requires that a suitable and sufficient assessment is required for each premises and water system under the responsibility of KCL in order to identify and assess the risk of exposure to legionella bacteria. The assessment should follow the requirements of BS 8580-1:2019 and HSG274 Parts 1-3. Where there is a risk, the significant findings of the assessment will be recorded. It is King's College London policy to record all assessments performed.
- 4.1.2 Following the legionella risk assessment, prevention of exposure to legionella bacteria or substitution with a less hazardous substance, or substitution of a process or method with a less hazardous one should be considered initially. However, if the risk cannot be eliminated then control measures are to be implemented to prevent the proliferation or exposure to legionella as far as reasonably practicable.
- 4.1.3 The university has appointed the Head of Engineering as the 'Appointed Responsible Person', the Head of Engineering will be deputised by Chief Engineering Officers and Lead Engineers at the campus level to ensure that findings of the assessment are suitably actioned and implemented. Appointed Responsible Persons are to be confirmed in writing, with roles and responsibilities agreed. This will be confirmed with the completion of F060-02-HSEPO Role Appointment Letter.
- 4.1.4 The campus Lead Engineers, Maintenance Managers, Assistant Maintenance Managers/Team Leaders and Senior Maintenance Technicians will assist the Appointed Responsible Persons in their roles. Together, these persons have the day-to-day managerial responsibility for the management of legionella on the premises and for supervising the implementation of the precautions. The Estates Safety & Compliance Team will provide administration and compliance support.
- 4.1.5 Each building at King's College London will be risk assessed on an individual basis due to variations in water system design, construction and operating conditions. Both temperature and biocides (principally chlorine dioxide) are currently in use within the portfolio. However, as the use of biocides, particularly chlorine dioxide, introduces potentially harmful chemicals to the water system the university is keen, in order to reduce additional risk from these substances, to revert to more traditional forms of legionella control where there will be no adverse effects on the control of legionella bacteria in these buildings. Members of the Legionella Risk Management Group in conjunction with reports / advice from the water treatment contractor and legionella consultant will review, assess and provide justification on the status and future need of the chlorine dioxide systems.
- 4.1.6 Temperature will be used as the primary means for controlling legionella bacteria, hot water is to be stored at 60°C or above at all times and distributed to all outlets at temperatures above 50°C within one minute of flow. Where temperature is found to be insufficient to control fully legionella proliferation, the risk assessment may recommend the use of supplementary means of control, chlorine dioxide or other biocides may be considered in these instances. Where applicable, the

university will adopt both temperature and biocide/chlorine dioxide monitoring preventative regimes.

- 4.1.7 A technical specification for the provision of legionella risk assessments has been developed to ensure the delivery of service in accordance with L8, HSG274 and BS8580.

Risk Assessment Coverage

- 4.1.8 The risk assessment must cover the entire domestic water system in each premises as well as any other risk systems such as air handling units, humidification systems, irrigation systems, and rainwater harvesting systems. The risk assessor must examine the design of the system as well as the manner of its operation that may lead to the proliferation of legionella bacteria or conditions that may favour increased levels of microbiological activity.
- 4.1.9 Where new unknown water systems are identified within KCL premises or new water systems are installed, these should be made aware to Estates Safety & Compliance and Engineering to ensure that a legionella risk assessment is conducted on the system. It may be relevant dependant on perceived risk for the system to be taken out of operation until the risk assessment findings are reported.

Sampling

- 4.1.10 Microbiological sampling of the water systems as part of the legionella risk assessment is not routinely completed. However, sampling may be necessary where considered necessary by the risk assessor and where in agreement from the service provider and Estates Safety & Compliance; especially should an unfamiliar equipment or process be in use. Additionally, it may be necessary for samples to be taken in order to verify the effectiveness of the current preventative regime. Furthermore, routine microbiological sampling, to include legionella, is undertaken by the water treatment contractor as part of their service provision to confirm that the control regime remains effective in controlling the proliferation of legionella bacteria.

4.2 Cooling Towers and Evaporative Condensers

- 4.2.1 King's College London does not own or manage any properties that utilise cooling towers or evaporative condensers. However, the university may occupy premises that incorporate such installations. In these cases, the responsibility for the maintenance, monitoring and management of such installations is the responsibility of the relevant building owner or managing agent, as identified by their legionella management plan.

4.3 Other Risk Systems

- 4.3.1 Other risk systems which are present within KCL premises are required to be identified and considered in the legionella risk assessment. Examples of such systems known to be present within KCL premises are expanded on below.

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- 4.3.2 Wet fire suppressions systems such as hose reels and sprinklers must be considered during the risk assessment. The risk assessment must document the configuration of the installed wet firefighting system as well as the current planned preventative maintenance regime in place. If these systems incorporate a storage tank water within the system will often suffer from poor turnover and stagnation. However, in the event of a fire the risk from the fire will outweigh the risk from legionellosis. Where systems do not incorporate a storage tank, stagnation of water may still be possible within the lines supplying the hose reels and sprinkler systems. The assessor is therefore expected to ascertain that the controls to prevent exposure to water held within fire prevention systems and aerosol created during routine tasks is minimised and that documented procedures are in place. Where wet firefighting systems are in place, a copy of the legionella risk assessment will be passed to the Fire Systems Maintenance Contractor. Fire Systems Maintenance Staff should receive relevant water management training to ensure staff are aware and competent in preventing aerosol release and transmission during routine maintenance.
- 4.3.3 Any humidification systems installed within the properties shall be included in the risk assessment process. A variety of steam and atomising humidifiers are in use with the university's properties. The risk assessment will assess the current preventative regime in place and give advice regarding written control scheme tasks for the continued safe operation of these units.
- 4.3.4 Condensate resulting from cooling coils within the air handling units could pose a very low risk of legionellosis e.g. if the traps do not allow water to drain away freely or if the coils are not kept in a hygienic condition. The risk assessment will include such facilities and detail if any legionellosis preventative measures are required.
- 4.3.5 Closed water systems such as chilled water heaters and heating systems should be considered in the risk assessment. By design these systems are closed systems and do not provide potential for a generation of aerosol except during routine maintenance and inspection. As such these systems will be considered to be of negligible or low risk. However the make-up supplies to these systems from the domestic systems need to be assessed to ensure suitable back flow protection is fitted and no dead-legs / dead-ends remain on the system. The risk assessment will include these systems and detail if any legionellosis preventative measures are required
- 4.3.6 Irrigation systems installed to green spaces and sports grounds / pitches should be considered as part of the risk assessment. The water supply, storage, means of water delivery, location of system and usage period such as all year or seasonal, as these will affect the potential risk these systems pose. The risk assessment will include these systems and detail if any legionellosis preventative measures are required
- 4.3.7 Rainwater harvesting systems installed to various premises across KCL estate are to be considered as part of the risk assessment where fitted. These systems have been identified to the estate for toilet flushing and to supply irrigation systems. The location, purpose, design, presence of microbial control, and usage period will be considered as part of the risk assessment. The risk assessment will include these systems and detail if any legionellosis preventative measures are required

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- 4.3.8 The university also recognises the presence of water softeners, powered dental equipment, fountains, decorative water features, and fire suppression systems within the building's it occupies, and these must be included in the legionella risk assessment process and the guidance in HSG274 Part 3 followed. Where such plant is identified by the risk assessor, the responsibility of the equipment / system should be confirmed to ensure required controls are implemented.
- 4.3.9 Due to the use of many of the university's properties, we expect that there may be processes or equipment that could pose a risk of legionellosis if not properly maintained. The assessor will perform the necessary investigations as part of this risk assessment process in order to identify any process that could pose a risk, e.g. those that utilise water between 20°C and 45°C, incorporate a storage vessel and those that create an aerosol.
- 4.4 Review of Documentation as part of the Legionella Risk Assessment**
- 4.4.1 The written control scheme in place for all buildings will be appraised as part of each legionella risk assessment and recommendations given regarding its adequacy in controlling legionella proliferation. This appraisal will include examination of the e-logbook records for compliance with L8 and completeness. Records for at least the past 24 months (if available) will be examined in order for the frequency of 6 monthly and annual tasks to be gathered. For further information regarding the contents of the water e-logbooks, please refer to Section 5.3 of this plan.
- 4.4.2 The management responsibilities for each building will be checked. Specifically, the duty holder and responsible person for each property will be clearly documented. Lines of communication and the reporting structure will be clear and unambiguous and contain full contact details for all persons involved.
- 4.4.3 Formal training records for all staff will be held electronically and access to these records will be arranged for the assessor as part of the assessment process. The assessor will give recommendations regarding any training gaps noted. Examination of the e-logbook records will also be used as a guide for the level of competence of the staff. Where external contractors are used to perform tasks listed under the written control scheme, up to date membership of the Legionella Control Association will be used as a guide for staff competence. Any queries regarding site records logged by external contractors will be highlighted.
- 4.4.4 Calibration certificates for both internal KCL staff equipment and contractors equipment such as thermometers, chlorine dioxide test kits and photometers are held electronically to allow review by the legionella consultant. Where equipment is outside if calibration this is highlighted in the risk assessment actions.
- 4.4.5 Additionally, items of documentation such as the up-to-date schematic of the water services, method statements, analysis certificates and disinfections certification will all be held within the e-logbook. Omissions or inadequacies in the site documentation will be detailed in each legionella risk assessment report to achieve full compliance with the ACoP and Guidance in L8 and HSG274.

4.5 Risk Assessment Reporting

- 4.5.1 A full Legionella Risk Assessment report will be provided to King's College following the completion of the risk assessment. The report structure will also include an Executive Summary to highlight the key findings of the assessment. Legionella Risk Assessment recommendations will be managed through the CAFM system.
- 4.5.2 The risk assessment will clearly prioritise all recommendations given and give a timescale for completion. A Risk Scoring System or Risk Algorithm as detailed in BS8580 is preferred, so long as it is unambiguous and repeatable.
- 4.5.3 If very high / high priority recommendations are made at the time of the assessment, these will be communicated verbally and via email to the Lead Engineers, Maintenance Manager and the Estates Safety & Compliance. This will enable any immediate remedial actions to be performed in advance of the formal report being received. Any job orders raised on the CAFM system in advance of the report are referred to in the risk assessment once issued for audit trail.
- 4.5.4 When risk assessments are issued to KCL by the Legionella Consultant, these are reviewed by the Estates Safety & Compliance Team for accuracy, and agreement of findings before these findings and actions arising from the assessment are discussed and ownership of actions are agreed with the appointed responsible persons or representatives as relevant. The report will then be issued by Estates Safety & Compliance to the relevant responsible persons and campus maintenance teams for review and appraisal.
- 4.5.5 A full and tailored legionellosis preventative regime will be given for all buildings to allow any identified risks to be controlled as far as reasonably practicable. Of particular note, the efficacy of the installed preventative regime will be recorded. Where biocides or chlorine dioxide are recommended to be discontinued as part of a property's legionella written control scheme the practicalities and implications of changing the control regime will be detailed as well as any increased monitoring arrangements.
- 4.5.6 Where the risk assessment shows there to be no foreseeable risk of exposure to legionella bacteria within the building (e.g. due to drainage of water systems in unoccupied buildings) a record of the assessment will be maintained electronically. A written control scheme will not be implemented for the premises and no monitoring will be performed.
- 4.5.7 Before any contract on the provision of Legionella Risk Assessments is finalised the structure and content template must be agreed with the Estates Safety & Compliance Team and the Head of Infrastructure Safety to ensure the provider meets the requirements of L8/HSG274 and the risk assessments will provide the desired standard of service and competent advice.

4.6 Risk Assessment Review

- 4.6.1 The university's Legionella consultant must review each legionella risk assessment at least every two calendar years, or if there is reason to believe that the original risk assessment may no longer be valid. Examples of when a legionella risk assessment for a property requires review include:

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- Identification of new water systems not previously known to be present by KCL within the Estate
- Changes to the water system or its use.
- Changes to the use of the building in which the water system is installed.
- The availability of new information about risks or control measures.
- The results of checks indicating that the control measures are no longer effective.
- A case of Legionnaires Disease or legionellosis is associated with the system.
- Changes to key personnel.
- Detection of legionella bacteria in the system between 100 cfu/litre and 1000 cfu/litre where repeat failures are observed, or the majority of samples have returned failures and indicate that the control regime is no longer valid.
- Detection of legionella bacteria of >1000 cfu/litre where it indicates that the control regime and risk assessment is no longer valid.

4.6.2 Where systems are considered higher risk either by the legionella consultant or KCL, the review period will be reduced. Annual reviews of legionella risk assessments will be performed for all halls of residences, sports grounds and any property deemed to be of higher risk to the proliferation of legionella bacteria. The frequency of additional buildings will be determined by the risk assessor. A list of the buildings requiring annual reviews of the risk assessment are identified in the [EF-ASU-02-PR08](#) Document.

5.0 TESTS AND INSPECTIONS

- 5.1 The basis of the test and inspection regime for each building will be determined by the written control scheme as detailed in the legionella risk assessment. It is expected that monitoring tasks and checks will be compliant or in excess of the provisions given in the ACoP L8 and Guidance document HSG274.

5.2 Monitoring procedures

- 5.2.1 Due to finite staffing resources at King's College London, the nominated water treatment contractor will undertake a number of the tasks and checks prescribed in the written control schemes. Please refer to Table 2 for full details of the minimum frequency of legionella management tasks.
- 5.2.2 The Water Treatment Contractor will perform routine six-monthly (increased to monthly for buildings under biocide control) sampling for legionella analysis of domestic water systems. Additional sampling for legionella bacteria must be performed if advised by the risk assessment. Sampling should be carried out in accordance with BS7592:2008 and the water treatment contractor will determine the appropriate number and location of samples to be taken by the complexity of the system. Samples must be taken from separate hot and cold outlets and typically not from outlets supplied by TMVs/TMTs. Where samples are collected from TMVs/TMTs and legionella bacteria are identified, the nearest separate hot and cold-water outlets must also be accessed as part of re-sampling. Where positive samples are returned, the university's legionella escalation policy should be adopted. This is held in EF-ASU-02-PR08.
- 5.2.3 Where levels of building occupancy changes for a significant period of time such as in the event of the Covid-19 Pandemic, which may have the potential to reduce the level of turnover within a building. It may be considered necessary to increase the frequency of legionella sampling frequency from six monthly. This will be conducted on a building-by-building basis and assessed depending on system risk.
- 5.2.4 For other risk systems where microbiological / non-bacteriological sampling is considered necessary by the risk assessment to confirm the control scheme is effective, this sampling regime will be developed and completed by the water treatment contractor with the consultation of Engineering, Estates Safety & Compliance and the legionella consultant as necessary.
- 5.2.5 Following any changes in the written control scheme for a building or if monitoring results are consistently out of specification, legionella sampling as given in L8 and HSG274 will be performed until the system is deemed to be under control as advised by the Legionella Risk Management Group. Sampling could include weekly sampling, utilising qPCR, rapid assay and culture as applicable. In this situation, a formal review of the legionella risk assessment by the Legionella Consultant will also be sought.
- 5.2.6 Hot water storage vessel/hot water storage internal inspections will require coordination between the water treatment contractor and directly employed labour/Maintenance teams. It is expected that directly employed labour will facilitate the inspections by draining and opening up the vessels to

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allow internal inspections by the nominated water treatment contractor (this could include the use of boroscope inspection to minimise disruptions to building users). Inspections must be timed to ensure minimum disruption to the building's hot water service. Where internal inspection is not possible, documentation in support of this must be provided by the water treatment contractor and a flushing/purging of the vessel's drain valve must be performed in lieu. Referenced photographic evidence to support internal inspections must be provided following inspections, either appended to the site log sheets or emailed to the local Maintenance team and Estates Safety & Compliance Team. Pasteurisation of the hot water storage vessel will be conducted following completion of internal inspections.

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Table 2 – Minimum frequency of Legionella Management Tasks

Frequency	Description	Responsibility
Weekly	Flush each of the outlets and pipework including bypasses, known to be infrequently used, eye wash stations and all showers.	DEL or their FM representative
	Weekly alternation of multiple pump sets and sequence controls.	DEL or their FM representative
	Weekly chlorine dioxide plant checks	Water Treatment Contractor (WTC)
	Base Exchange Softeners Visually check the salt levels and top up salt, if required. Undertake an on-site hardness check to confirm satisfactory operation of the softener	DEL or their FM representative
Monthly	Check temperature of the hot water system storage vessels (check both flow and return temperatures as applicable).	WTC
	Type 1 and 2 water heater temperature checks.	WTC
	Check sentinel hot and cold-water outlet and TMV inlet temperatures.	WTC
	Check sentinel hot and cold-water outlet and TMV chlorine dioxide levels.	WTC
	Check incoming mains water temperature to the building	WTC
	Purge of expansion vessels	WTC

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Frequency	Description	Responsibility
	Exchange of point of use legionella filters (shower heads or outlets) ²	WTC or DEL as instructed
Quarterly	Clean, descale and disinfect or replace all shower heads, shower hoses, spray taps, spray nozzles, and spray hoses where fitted.	DEL or their FM representative
6 monthly	Record water temperature at ball-valve and remote from ball valve in all cold-water storage tanks.	WTC
	Internal and external inspection of the cold-water storage tanks and identify potential remedial actions as necessary.	
	Inspect the integral cold water header tanks of type 1 water heaters (Combination water Heaters) as part of the cold-water storage tank inspection regime and identify potential remedial actions as necessary.	WTC
	Type 3 water heater supply and delivery temperature checks.	WTC
	Flexible pipework inspection	WTC
Annually	TMV servicing and fail-safe testing (including strainers and filters)	WTC
	Visually check internal surfaces of hot water storage vessels and check appearance for scale and sludge or flush drain and note appearance of water.	DEL or their FM representative for draining WTC for inspections
	Service and disinfection of base exchange softeners. Frequency to be adjusted as per manufacturer's instructions	Approved contractor
	Calibration of test equipment	DEL or their FM representative/ WTC

² Point of use filtration must be at least 0.2µm sterilising grade filters which proven microbiological retention efficacy in accordance with ASTM F838-05 standard and be WRAS approved products and materials. Point of use filtration should be used as a temporary control measure in the event of legionella detections and should not be considered as a long-term solution in the absence of engineering controls.

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Frequency	Description	Responsibility
	Check all hot, mains and cold-water outlet temperatures and TMV inlet temperatures. All outlets to be accessed over the course of a year as far as reasonably practicable e.g. 10% each calendar month	WTC
	Check all hot, mains and cold-water outlet chlorine dioxide levels. All outlets to be accessed over the course of a year as far as reasonably practicable e.g. 10% each calendar month	WTC
	Clean and disinfection of all cold-water storage by specialist contractor.	WTC
	Review outlet cleanliness. All outlets to be accessed over the course of a year as far as reasonably practicable e.g. 10% each calendar month	DEL or their FM representative/ WTC

Sampling		
6-monthly	Collection and analysis of samples from representative outlets for the identification of legionella bacteria. 10% of outlets to be sampled over the course of a year ³ .	WTC
	Collection and analysis of samples from all academic shower outlets and 25% of showers within halls of residence and sports grounds for the identification of legionella bacteria.	WTC
	Collection and analysis of samples from all cold-water storage tanks used for the provision of drinking water for the identification of Coliforms, E. coli and general bacterial levels	WTC
	Collection and analysis of samples from all cold-water storage tanks with hollow supports for the identification of Coliforms, E. coli and general bacterial levels	WTC
Annually	Collection and analysis of samples from representative drinking water outlets.	WTC

Documentation		
Two-yearly	Review of legionella risk assessment for academic buildings unless confirmed to require annual review if deemed to be of higher risk to the proliferation of legionella bacteria.	Legionella Consultant (LC)
Annually	Review of legionella risk assessment for all halls of residences, sports grounds / gyms, and any property deemed to be of higher risk to the proliferation of legionella bacteria.	Legionella Consultant (LC)
	Review of documentation	WTC

³ Sample frequency is dependent on legionella control regime; all properties will have sampling at least every six months, however properties with chlorine dioxide dosing will typically have sampling performed on a monthly basis.

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	Legionella Management Review	DEL or their FM representative
As required	System Alterations - Plant/System Alterations, Modifications of schematic drawings and Modifications Notification	DEL or their FM representative/ LC
	Corrective action completion – fault and problem notification (recorded on e-logbook under “Results Notes”)	DEL or their FM representative/ WTC
On-going	Action recommendations in Legionella Risk Assessments/ Reviews/Audits (recorded on the CAFM system)	DEL or their FM representative/ WTC

5.2.7 The sentinel outlets will be identified as part of each building's legionella risk assessment.

5.2.8 Appendix 1 details the written control scheme that forms the basis of the contract specification for our legionella consultants and water treatment contractors. The summary of the required L8 and HSG274 tasks can be produced from the legionella e-logbook.

Note 1:

It is recognised that the university owns and occupies a small number of properties where hot water storage/flow temperatures of greater than 60°C are unable to be consistently attained due to the presence of hot water systems that are no longer able to meet the demands of the property. In these properties, the control of legionella bacteria becomes reliant on the use of secondary means of controlling legionella bacteria such as chlorine dioxide or biocides, as well as the low-use flushing regime.

For these properties, hot water at temperatures sufficient for hygiene and disinfection purposes must still be stored and delivered to outlets. This will typically be water in excess of 50°C within one minute of flow. It is the responsibility of the local maintenance teams to try to revert to temperature being utilised as the primary means of control. It is expected that this can be achieved by system re-design that forms part of planned capital or campus level refurbishment or dilapidation projects.

5.2.9 Written control scheme tasks required for other risk systems will be dictated by the risk assessment. Tasks will be performed at minimum frequency in accordance with HSG 274: Part 3: The Control of legionella bacteria in Other Risk Systems.

5.2.10 The systems as identified by risk assessment shall be maintained in a clean and sound condition and must be easily and safely accessible.

5.2.11 All systems shall be frequently used (at least weekly), or suitably flushed to simulate the necessary usage frequency, in order to avoid stagnant water which will increase the potential of bacterial growth and proliferation. The usage frequency shall be regularly monitored and reported.

Further guidance for infrequently used outlets

5.2.12 Management staff and their designated deputies shall have the responsibility of identifying all infrequently used outlets within their area and subjecting these to a weekly flushing programme. The records to confirm the completion of flushing of little used outlets are held within paper records/the e-logbook. Where applicable for sentinel outlets, water delivery temperatures (hot, cold or blended) shall be taken and recorded.

5.2.13 Infrequent outlets within a premises will be reviewed regularly to identify and add or omit assets to make sure that this list is up to date. Any changes to the list of infrequently used outlets should be

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raised at the Legionella Risk Management Group and approved by Engineering and Estates Safety & Compliance.

- 5.2.14 Where infrequently used facilities are deemed no longer required, the outlets and all associated pipework shall be removed.
- 5.2.15 Where a building or sections of the system remain unused for long periods, the following steps shall be undertaken, please also refer to procedures for vacant premises.
1. Flush all water facilities (including toilet and urinal cisterns) thoroughly on a weekly basis whilst the building is not in use. For healthcare premises, at least twice weekly flushing should be performed in accordance with HTM04.
 2. If the facilities within a building are to remain unused for a prolonged period (more than one month), then each building should be considered in isolation to determine the appropriate measure between the following : -
 - a) System to be drained down (including all vessels) and cleaned and disinfected (any hot water storage vessels are to be pasteurised) prior to being allowed back.
 - b) For buildings which are closed a mothballing procedure in line with HSG274 Part 2 and SFG-30 should be followed. Prior to reoccupation each entire water system, including storage vessels, must be cleaned, flushed and disinfected as specified in BS EN 806, BSI PD 855468 and BS 8558 prior to use. Details on mothballing are located in [section 5.6](#).
 3. Consideration shall be given to isolating the unused sections from the system and possibly removing pipe-work and fixtures completely to avoid "dead-legs".
 4. In addition to the flushing regime described above, careful consideration should be given to the usage requirements of the system and any required system changes made accordingly. If it is deemed that the facilities remain unused for prolonged periods, or are being used seasonally, then the following should be considered where practical:
 5. Re-engineer the system where practicable depending on building use or water demand so that all CWS throughout the system are provided directly off the MCWS supply. This action will enable the isolation and removal of any cold-water storage tanks
 6. As part of the re-engineering of the hot water services, it is also recommended where practicable depending on building use or water demand that any hot water storage vessels are isolated and removed from the system and replaced with the required number of 'Type 2 (point of use) or Type 3 (instantaneous) water heaters of less than 15 litres in volume.
 7. The absence of water storage vessels will reduce the inherent risk of storing stagnant water although it will not negate the need for flushing the remaining system.

Fire Hose Reels

- 5.2.16 Fire hose-reels supplied by the mains water service. Where the line supplying the hose-reels is exclusive, distinct and separate from the line supplying domestic facilities, the fire line shall be fitted with a minimum of a double check valve.

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- 5.2.17 Where the fire and domestic supplies share the same line, each hose-reel spur shall be fitted with a double check valve at a minimum. It is important, however, to ensure that the valves are fitted as close to the domestic line as possible in order to ensure that the dead-leg up-to the valves is kept as small as possible. Where the installation of double check valves is not practicable, each unit shall be subjected to a weekly flushing regime in order to minimise stagnation and the potential for increased bacterial proliferation.
- 5.2.18 Although the removal of fire hose-reels and their replacement with local fire extinguishers is the ideal solution, this may not be readily practicable in some cases. Prior to the removal of any hose reel system there must be full consultation with the Head of Fire Safety (H&SS) and the Head of Fire Assurance (Estates & Facilities). Where fire hose reels are considered no longer required for fire protection purposes, these systems should be drained and isolated, with appropriate lock off tag off procedures adopted. Appropriate signage to be implemented to inform users that the system is no longer in use. The risk assessment should also be updated to confirm the removal of this system.
- 5.2.19 Competent persons shall perform regular checking of the hose-reels, for operational integrity. This task, however, shall be carried out with due care and attention, ensuring that the creation of aerosols is maintained as practicably low as possible.

RPZ Valves

- 5.2.20 If Reduced pressure zone (RPZ) valves are installed in lieu of double check valves, they must be commissioned by a qualified engineer and subject to annual testing. All installations must be notified to Thames Water. As part of the risk assessment reviews, any RPZ valves identified will be raised with engineering, barcoded and included in the annual servicing schedule.

Eyewash Stations and Emergency showers

- 5.2.21 Plumbed eyewash units should be flushed weekly to reduce bacterial contamination and to verify proper operation. The water in a self-contained (bottle) eyewash station must be refilled, disposed, and maintained in accordance with manufacturer's instructions and replaced before the use-by date is passed. Emergency showers should also be flushed weekly to clean the line and verify proper operation. Eye wash units and emergency showers should be included as part of the quarterly clean, descale and disinfecting regime as stated in section 5.2.21.

Further guidance for showers and spray outlets

- 5.2.22 All showers (showerheads and associated hoses) and spray outlets shall be maintained in a good and clean condition and free from excessive scale and dirt deposition. Where TMVs are fitted, they shall be maintained and operated at 41°C (±2°C).
- 5.2.23 All showers and spray outlets shall be subjected to regular temperature monitoring, where TMVs are not fitted temperature restrictors should be in place to help reduce scalding temperatures. The maximum mixed/hot water delivery temperature prior to the limiter should be 50°C and post limiter should be 45°C.

- 5.2.24 Where showers are to be installed or refurbished, it should be considered to install or replace these with electric showers from the mains water service rather than mixer showers to reduce the risk.
- 5.2.25 All shower heads/hoses and spray outlets (without exception) shall be either:
- inspected at least on a quarterly basis and de-scaled, cleaned and disinfected. The disinfection process shall include all associated hoses, or;
 - inspected at least on a quarterly basis and replaced with a new head and hose, or;
 - if fitted, legionella filtering showerheads must be replaced at least every 30 days or as per manufacturer's instructions if required more frequently than 30 days.

5.3 Procedures for actioning out of specification results

Out of Specification Results

- Faults or out of specification results identified as part of the written control scheme tasks are automatically documented within the e-logbook (as a Result Note). An automatic email is issued weekly to applicable Lead Engineers, Maintenance Managers, Team Leaders and Senior Technicians to advise them of new and open issues on a weekly basis.
- Records relating to faults and out of specification results are to be managed and subsequently signed off/closed by the Appointed Responsible Person, or his nominated deputy to ensure an audit trail.
- High risk out of specification results within the last 7 days are reported via an automatic report by email to Estates Safety & Compliance every Monday morning, and orders are raised on the CAFM system to rectify the issues. The failure types identified in this category are calorifier temperatures, TMV failsafe failures, and CWST inspection failures.

Unsatisfactory Microbiological Sample Results (including legionella)

- Legionella detections and out of specification microbiological test results are to be notified via email by the Water Treatment Contractor to the maintenance team. The legionella escalation procedure located in EF-ASU-02-PR08 should be adopted following the detection of legionella bacteria.
- Legionella detections and out of specification microbiological test results will be recorded in the e-Logbook with the creation of an Asset Note. This will be updated with supporting certification, actions requested/taken and closed upon receipt of sample results confirming no legionella detected.
- Legionella detections and out of specification microbiological test results which are reported by the water treatment contractors are logged on the Microbiological Sample Result Failures Log spreadsheet which is managed by Estates Safety & Compliance. Remedial works for these failures are then raised on the CAFM system. When satisfactory results are returned from resamples, these failures are closed out on the spreadsheet.

Emergency Call-Outs

- Emergency call-outs are to be notified via email to the maintenance team. The e-logbook must be updated with the non-compliant result/s to allow the Result Note to be created.

Could Not Complete Tasks/Inaccessible Locations

- Inaccessible locations and tasks which could not be completed are to be notified via the e-logbook to the maintenance team with supporting reasoning to allow investigation and rectification where possible.

High Risk Non-Conforming Results / Findings

- Where non-conforming results or faults are identified to Chlorine Dioxide Units, Hot water Storage Vessels, Cold Water Storage Tanks, these are reported to the campus maintenance team verbally at the time of identification, and also followed up in writing via email to Maintenance Manager and Estates Safety & Compliance the same day.

Signing off/closing of faults and out of specification results must only be performed following the completion of satisfactory remedial actions e.g. satisfactory re-sample results. The results of the re-test/re-sample must be detailed within the Result or Asset Note.

5.4 Arrangements for Commissioning

- 5.4.1 The below steps are provided to form the minimum framework for the tests and inspection expected as part of commissioning domestic water systems to ensure risks from exposure to legionella are minimised or reduced as far as is reasonably practicable during commissioning and use of the systems. Additional or enhanced tests and inspections may be required for specific plant or environments such as NHS, research, and prolonged periods of low occupancy etc.

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Table 3 – Commissioning Components and Tasks

Component	Task
Domestic Water Systems	<p>Each entire water system, including storage vessels, must be cleaned, flushed, disinfected and certificated as specified in BS EN 806, BSI PD 855468 and BS 8558 prior to use.</p> <p>Disinfection certificates are to be provided to Estates Safety & Compliance for uploading to the e-logbook.</p>
Hot Water Services	HWS, including water heaters, to be turned on / reinstated including electrical or mechanical heat source and the system subject to a pasteurisation (for applicable assets). Certificates for thermal disinfection to be provided to Estates Safety & Compliance for filing on the e-logbook.
Domestic Water Systems	<p>Hot and cold-water temperature at sentinel temperature outlets, 10% of outlets and the nearest outlet per low volume water heater to be tested and recorded, with any non-conformances to be investigated and rectified.</p> <p>Temperatures to be retested and recorded once remedial works are completed.</p>
Domestic Water Systems	<p>Microbiological sampling for legionella bacteria and TVC samples to take place at a minimum of 10% of outlets in each building covering both the hot and cold-water systems, all sentinel hot and cold-water outlets, all hot water storage vessels, all cold-water storage tanks, and representative outlets to be sampled 2-7 days after the disinfection. Specific sampling arrangements will be conducted for each building as required.</p> <ul style="list-style-type: none"> • Rapid sampling PCR could be used in addition to the culture tests for higher risk buildings.
Domestic Water Systems	<p>Where localised commissioning is conducted, following refurbishment / new installation to part of a water system, a bespoke sample plan is to be generated to ensure representative coverage of all water services are sampled.</p> <p>This is to be consulted with Engineering / Estates Safety & Compliance.</p>
Domestic Water Systems	Update written control scheme as necessary and commence twice weekly flushing at all outlets until use of the building or section of building is handed over and occupation commences. Records are to be sent to the Statutory Compliance Team.
Barcoding of Assets	Water treatment contractor to be requested to add the new assets to the asset register on the e-logbook.
Contract Management	Water treatment contractor to be notified by way of Contract Change Notification for changes to their contracted activity.
PPMs	Initiation of e-logbook and PPM tasks schedules, to include (but not limited to) water softener, filters, vending/drinking machines, shower descales and flushing
Legionella Risk Assessment	Arrange for a review of the building's legionella risk assessment within 1-month handover for significant changes

5.5 Arrangements for Change Control

- 5.5.1 Procedures for change control should be followed in accordance with EF-ASU-02-PR08.
- 5.5.2 Before any change is considered to the water system, the legionella consultant must be consulted so that advice can be sought and a procedure to ensure that the water system remains under control with regards to legionellosis throughout the transition drafted by the managerial responsible person.
- 5.5.3 A regular agenda item regarding change control will form part of the agenda for the Legionella Risk Management Group. The management team are required to raise all potential changes to the domestic water systems, including those commissioned or resulting from capital or campus projects.

Proposed change to the legionella control regime (including new technologies)

- 5.5.4 These changes may include but are not limited to:
- a) Installation or removal of biocide dosing apparatus, including chlorine dioxide.
 - b) Any changes proposed to the written control scheme for cost saving.
 - c) Major replacement, removal, addition or modification of pipework or outlets (including cold water storage tanks, hot water storage/generation vessels).
 - d) New Technologies
- 5.5.5 It is acknowledged that there may be circumstances where the local maintenance team wish to implement a new technology, e.g. use a new biocide to assist with the control of legionella in a property, or for a water treatment technology to be removed to allow the preventative regime to be returned to full temperature control. This may be following recent failures of the current method of control, following a change in use of the building or the availability of new technology etc.
- 5.5.6 The person initiating the proposed change (including Project Manager) must raise the proposed change at the Legionella Risk Management Group Meeting and produce a procedure to ensure that the water system, throughout the transition process, remains in control concerning legionella. This will include but not limited to, isolation requirements, assets which will be out of use (so these can be suspended on the e-logbook), outlets which will require flushing weekly during the project, responsibilities for flushing i.e. KCL or contractor, consideration for the potential impact on other water services within the building.
- 5.5.7 The proposal and procedure will be forwarded to the Water Treatment Contractor and Legionella Consultant by the Estates Safety & Compliance Team, if not present at the Legionella Risk Management Group Meeting. The Legionella Consultant will comment and give recommendations on the proposal. The procedural document produced must give details of any additional tasks or checks which will be required as well as the arrangements that will be adopted to ensure that the legionella risk assessment for the property remains current. The applicant is responsible for ensuring that funds are available in the event that a proposal for change is approved to proceed.

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- 5.5.8 If approved, actions to implement measures detailed in the associated procedure should be taken and the transition process can commence. The water treatment contractor and legionella consultant must also be informed of the proposed changes in writing to allow the contracted tasks to be updated if required and a Contract Change Notice issued, if required.
- 5.5.9 Upon completion of the transition period, the applicant must take the following steps:
- The legionella risk assessment and schematic drawing for the property (if applicable) must be updated following the change if considered necessary and the written control scheme modified if required.
 - The e-logbook must be updated with details relating to all implemented changes and the approved proposal must be filed within Section 8 of the property's legionella documentation. The maintenance team must perform this update.
 - Any changes to the asset register are to be updated on the e-logbook including removing any redundant assets or adding new ones.

New Technologies

- 5.5.10 Following at least one year of satisfactory data (legionella sampling and monitoring test data) from the trial phase, the Legionella Risk Management Group supported by the Water Treatment Contractor and Legionella Consultant, must make a final evaluation of the proposed change. As part of the evaluation the Legionella Consultant will give advice regarding the future monitoring frequencies including whether any additional controls are required in the near to midterm. If the above prove satisfactory, the Estates Safety & Compliance Team will formally sign off the change control.

5.6 Project work and CDM

- 5.6.1 Any project work that includes the replacement, addition, modification or removal of outlets or pipework on a small scale must include a statement of proposed and actual changes to a building's water systems and services. Where there is more than one contractor to a project, KCL will appoint in writing a Principal Designer and Principal Contractor. In addition, the following information must be provided to ensure compliance with Construction (Design and Management) Regulation 2015 (CDM):

Pre-Construction Information (KCL / Principal Designer)

Pre-construction Information (PCI) must include all known or reasonably ascertained hazards in relation to the space or planned activity due to be carried out and should be provided before the commencement of any works in order for the Construction Phase Plan and Health and Safety File to be created. The PCI should include the following information:

- Legionella Management Plan
- The current legionella risk assessment for the building and highlighted recommendations that are included within the scope

- Extract from the written control scheme tasks that will be required for the duration of the project
- List of assets located within project demise (affected assets)
- Any current positive legionella detections to the domestic water systems

Construction Phase Plan (Principal Contractor)

The Construction Phase Plan is to include a section on how the contractor proposes to control the risk of legionella. This is applicable to all projects even if they are:

- working on an isolated system
- altering the domestic water system
- not working or altering e.g. just painting and decorating (they will need arrangements for flushing, temperature monitoring as applicable for their areas).

Health & Safety File (Principal Designer / Principal Contractor)

- Risk Register (including live and residual risks)
- Commissioning and disinfection certification and RAMS
- Consideration of pre project sampling to confirm water quality prior to works
- Post disinfection sampling
- Asset register (removed and installed)
- Record sheets to confirm flushing and monitoring tasks during construction phase
- Manufacturers information

The Lead Engineers, deputised by the Maintenance Manager, is responsible for ensuring that the changes are reflected in the e-logbook and that the legionella consultant is contacted to update the domestic water services schematic drawing.

5.7 Arrangements for Vacant Premises

- 5.7.1 The domestic water systems in vacant buildings should be managed so that microbial growth, including legionella in the water, is appropriately controlled. The current HSE guidance advocates for mothballing when buildings are required to be taken out of use temporarily. Mothballing is a compromise between adequate control of microbial growth, the use of the water for flushing (whilst avoiding waste) and degradation of the system by adding disinfectant. Mothballing processes and procedures should be adopted in accordance with HSE guidance document HSG 274: Part 2 Paragraphs 2.50 to 2.52.

Mothballing

- Systems should normally be left filled with water.

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- The system filled with water helps to avoid problems associated with the system drying out, including failure of joints and pipework corrosion.
- Management and administrative controls to be documented and communicated to all staff who could access the closed buildings.
- Storage vessels will be maintained in a sealed condition, i.e. lids and inspection hatches fitted to cold water storage tanks, localised water heaters, hot water storage vessels etc. will be securely closed in order to prevent contaminant ingress.

Draining

- 5.7.2 In certain circumstances, draining of an entire property may be preferable to mothballing. The legionella consultant and water treatment contractor should be consulted (Contract Review Meetings or via email) whenever a water system is proposed for draining.
- 5.7.3 Draining down results in moisture remaining in the system which is likely to allow the development of biofilm where there are pockets of water or high humidity. This must be fully considered as part of the commissioning programme and may require additional time and resources to ensure that risks from exposure to legionella are minimised or reduced as far as is reasonably practicable. Draining of part of a water system is not advised.
- 5.7.4 The following circumstances, draining may be considered appropriate:
- Entire property vacant pending demolition
 - Entire property vacant and pending full strip out and installation of new domestic water services
 - Entire property vacant and major refurbishment scheduled with completion scheduled for at least 6 months' time.
 - Entire property undergoing refurbishment when administrative or management controls to prevent the use of water may not be effective.
 - Entire property undergoing refurbishment where the potential unauthorised use of the water systems is possible which may pose a significant risk to contractors / staff working within the building.

Recommissioning

- 5.7.5 Documented and agreed commissioning protocols which include a suitable and sufficient timescale/programme. Please refer to Section 5.4 and section 5.2.12 for guidance.
- 5.7.6 Prior to reoccupation each entire water system, including all plant and appliances, must be cleaned, flushed and disinfected as specified in BS EN 806, BSI PD 855468 and BS 8558 prior to use.
- 5.7.7 Implementation of a flushing program for water services between recommissioning, and receipt of satisfactory sample results.
- 5.7.8 Microbiological verification samples to be collected between 2-7 days following system disinfection

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- 5.7.9 Chemical analysis of water samples to be obtained where it is considered to be required where concerns are raised to ensure water supply is potable.
- 5.7.10 Confirmation in writing to be documented to confirm all documentation has been received and that the relevant actions have been conducted following recommissioning.
- 5.7.11 Commencement of required water management tasks in accordance with the written control scheme.
- 5.7.12 Notification to legionella consultants to request the legionella risk assessment is reviewed / updated to reflect changes.
- 5.7.13 See also [EF-ASU-02-PR61 Empty, Retired or Newly Acquired Buildings](#)

5.8 Emergency Procedures

- 5.8.1 Out of specification results obtained as part of the legionellosis preventative regime are considered to include the following occurrences, any of the below would instigate the Estates & Facilities Emergency Procedures contained within [EF-ASU-02-PR08](#):
- 5.8.2 Out of specification domestic water delivery temperatures:
- Mains or cold-water temperatures in distribution recorded in excess of 20°C after two minutes
 - Stored and inlet cold water temperatures recorded to cold water storage tanks in excess of 20°C
 - Hot water delivery temperatures
 - Hot water temperatures recorded to unblended outlets and inlet pipework to thermostatic mixer valves (TMV's) / Thermostatic mixer taps (TMT's) below 50°C after 1 minute
 - Water heater delivery to unblended outlets below 41°C for instantaneous/type 3 water heaters
 - Blended temperatures supplied from thermostatic mixer valves outside the desired temperature range of 41°C (+ / -) 2°C
- 5.8.3 Out of Specification domestic water storage temperatures
- Cold water storage above 20°C
 - Hot water storage below 60°C
 - Hot water return temperatures recorded below 50°C
- 5.8.4 Water sampling defects
- Chlorine dioxide concentrations less than 0.1ppm or greater than 0.5ppm
 - Identification of E. Coli/Coliform in drinking/domestic water system
 - Isolation of legionella bacteria from the domestic water systems

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- Raised total viable counts >1000 cfu/ml from the domestic water systems.

5.8.5 Where out of specification results, as described above, are found as part of the legionellosis written control scheme, the Emergency Procedure as detailed in [EF-ASU-02-PR08](#) must be followed and the communications structure adhered to, as detailed in Figure 2.

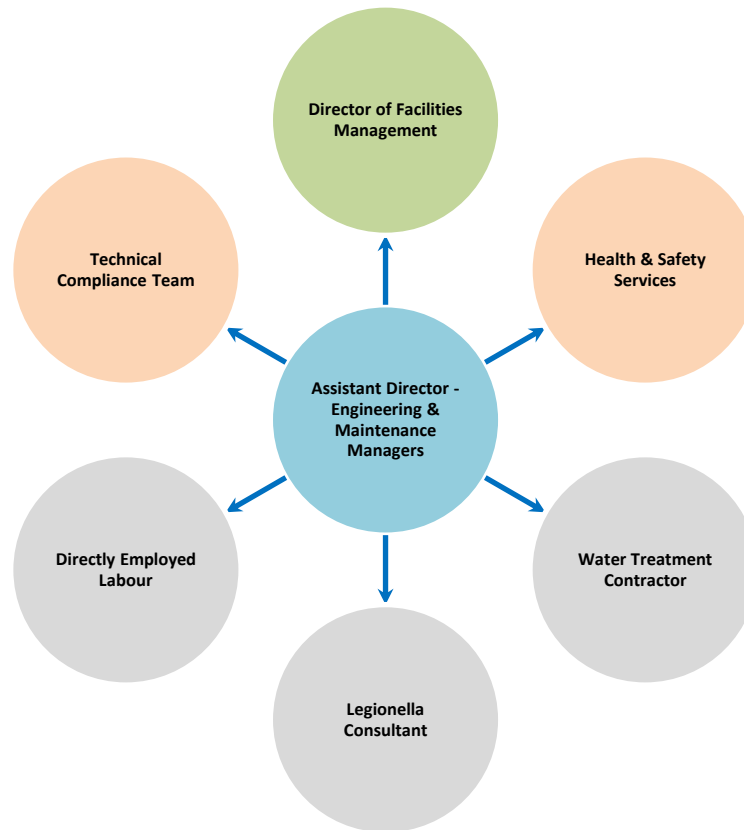


Figure 2 – Communication/responsibility chart for out of specification results

5.8.6 Communication has been identified in the L8 and HSG274 documents as a major contributory factor in outbreaks of legionellosis. Should out of specification microbiological results been obtained by the Water Treatment Contractor or Legionella Consultant then the local Lead Engineer or Maintenance Manager or his nominated deputy and Estates Safety & Compliance Team must be contacted via email. This reporting structure will allow an agreed course of remedial action to be taken. The primary investigating officer responsible for ensuring a suitable and sufficient investigation has taken place will be the Appointed Person on site, often the Chief Engineering Officer or Lead Engineer. Approved contact list for all out of specification results is held in EF-ASU-02-PR08.

5.8.7 Any accident/incident or near miss that affects the health and safety of an individual or group of individuals must be reported via the university's accident reporting system and any investigation undertaken will be led by the primary investigating officer(s) on site and copied to the Health & Safety Services.

Isolation of Legionella from the domestic water system

5.8.8 In the event of isolation of legionella bacteria from the domestic water system, the following actions must be taken.

Table 4 – Isolation of Legionella bacteria levels and action required

Legionella bacteria (cfu/litre)	Action required
Less than 1000	<p>Either:</p> <ul style="list-style-type: none"> a. If only one or two samples are positive, the system should be re-sampled. If a similar count is found again, a review of control measures and risk assessment should be carried out to identify any remedial actions. b. The majority of samples are positive, the system may be colonised, albeit at a low level, with legionella. Disinfection (thermal and/or chemical) of the system should be considered but an immediate review of control measures and risk assessment should be carried out to identify any other remedial action required.
Greater than 1000	The system should be re-sampled, and an immediate review of the control measures and risk assessment carried out to identify any remedial actions, including possible disinfection (thermal and/or chemical) of the system. Re-testing should take place a few days after disinfection and at frequent intervals afterwards until a satisfactory level of control has been achieved.

Actions to be taken in the event of an outbreak or suspected outbreak of legionellosis.

- 5.8.9 The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR) requires employers and others to report accidents and some diseases that arise out of or in connection with work to the HSE. Cases of legionellosis are reportable under RIDDOR if a doctor notifies the employee and if the employee's work involves work on or near water services or cooling towers in the workplace.
- 5.8.10 An outbreak is defined as two or more confirmed cases of legionellosis occurring in the same locality within a six-month period. Locality requires a degree of judgement and is defined in terms of geographical proximity.
- 5.8.11 As part of the investigation and control of the outbreak, the university must assist and comply with the requests and recommendations given by the relevant enforcing authority. Such requests and recommendations may include:
1. 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.
 2. 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.
 3. To provide staff health records to discern whether there are any further undiagnosed cases of illness and to help prepare case histories of the persons affected.
 4. 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:

- a) Tracing of all pipework runs;
- b) Detailed scrutiny of all operational records;
- c) Statements from plant operatives and managers;
- d) Statements from water treatment contractors or consultants.

5.8.12 In addition, the university must chemically and or thermally disinfect any system which has been implicated in the outbreak; disinfection must follow the process of thermal / chemical disinfection of hot and cold-water systems as described in L8 and HSG274. The university's nominated water treatment contractor will perform this task and a site-specific method statement will be provided to the Primary Investigating Officer before the task is performed.

6.0 RECORD KEEPING AND AUDITING

6.1 Changes to the Estate

- 6.1.1 It is foreseeable that there will be changes to the Estate that affect the water systems within the buildings. At such times, communication between all areas of Estates & Facilities, Water Treatment Contractor and Legionella Consultant is critical.
- 6.1.2 Temporary or permanent removals of buildings from the contract or addition of buildings to the contracts must be communicated to the service providers. This must include building closures for projects as well as disposal or acquisitions. This communication will be via email from the Lead Engineer, or his nominated deputy, or at a Contract Review Meeting (if suitably timed). The Head of Contracts and Performance will then formally communicate these alterations to the Water Treatment Contractor and Legionella Consultant. A record of this communication will be maintained on the university's e-procurement portal (In-tend) or the communication portal (CEMAR).
- 6.1.3 Any planned changes which are to occur in any ongoing, new or planned project works will be raised and discussed during the Legionella Risk Management Group to ensure this is documented in the meeting minutes and added to the action tracker to ensure that the required tasks are completed to ensure the risks associated with legionella are considered and controlled.
- 6.1.4 Where buildings are to be no longer part of the estate through sale of property, demolition of building, or termination of the lease, a review of any outstanding legionella detections and outstanding legionella risk assessment actions are to be reviewed and actioned as far as reasonably practicable. Any actions which remain outstanding are to be communicated to the new landlord / occupier to ensure they are aware of the current risks within the building.

6.2 Acquisition of Premises

- 6.2.1 A copy of the current legionella risk assessment will be requested from the vendor when the university acquires properties. This will be forwarded by the Estates Safety & Compliance Team to:
- the Legionella Consultant for evaluation and provision of costs for a legionella risk assessment and for awareness of the recommendations arising from the previous risk assessment such as identified dead-legs etc. to ensure they are inspected and identified during the new risk assessment.
 - the Water Treatment Contractor for the provision of interim costs for a preventative regime.
- 6.2.2 Upon receipt of the King's College London instructed legionella risk assessment a full legionella preventative regime will be instigated in line with the university's policy, this must be instigated within one calendar month of occupation/ownership.
- 6.2.3 Upon acquisition of the property, and as part of the initial commencement of the preventative regime, microbiological water samples will be collected in accordance with the KCL sample requirements to ascertain the current state of the water systems.

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- 6.2.4 For newly constructed properties, the O&M manuals, upon hand over of the building, will be forwarded to the Legionella Consultant and Water Treatment Contractor in lieu of the previous legionella risk assessment. Steps, as above, will be performed to ensure that a site-specific legionella risk assessment and written control scheme are in place within two months of building hand over.
- 6.2.5 Project Managers will be responsible for ensuring that the above information is available within 2 weeks of handover. See also [HS58 Empty, Retired or Newly Acquired Buildings](#). Where possible, the legionella risk assessment for the property will be completed prior to building handover to allow a written control scheme to be implemented. Any statutory issues identified can be rectified prior to handover and occupation. The risk assessment may require to be reviewed following occupation.

6.3 E-Logbooks

- 6.3.1 The documentation relating to the legionellosis preventative regime for a building will be held within the e-logbook. The e-logbook is accessible from any computer with an internet connection by users holding login credentials. This will include items of documentation such as the up-to-date schematic of the water services, method statements, analysis certificates and disinfections certification. Water management tasks completed as part of the preventative scheme and that are held on the e-logbook include but are not limited to flushing tasks, temperature monitoring, legionella filter replacements, CWST inspections, system clean and disinfections, TMV servicing / failsafe testing, hot water storage vessel inspections, record of sample collection, and chlorine dioxide testing / maintenance. The e-logbook is continuously increasing in its purpose, with the aim to be the sole repository of records for legionella management.
- 6.3.2 The maintenance team will retain, in their local offices, existing paper logbooks (utilised prior to November 2016) for a minimum period of two years. After this date, records may be removed from the offices and archived where they must be retained for a minimum of five years.

6.4 Disposal of premises

- 6.4.1 Upon disposal of a building, a copy of the most recent legionella risk assessment will be issued to the purchaser (if appropriate). Estates Safety & Compliance Team will suspend all task schedules associated with the property's written control scheme prior to disposal of the property to enable the records to be maintained on the e-logbook (in use since December 2016) indefinitely after the date of disposal/demolition. See also [EF-ASU-02-PR61 Empty, Retired or Newly Acquired Buildings](#).
- 6.4.2 Where the property is to be handed over, any legionella risk assessment actions which remain outstanding are to be communicated to the new landlord / occupier to ensure they are aware of the current risks within the building.

6.5 Risk Assessment

- 6.5.1 All legionella risk assessments must be kept for a minimum period of five years. The current legionella risk assessment for each property will be held within the e-logbook. Earlier legionella risk assessments are held by the Estates Safety & Compliance Team.

6.6 Management Reviews

- 6.6.1 To ensure that the precautions that have been implemented remain effective, the Directorate will implement a review regime, there are three review programmes undertaken:

Engineering Team Review

- 6.6.2 Reviews of the completion of the flushing tasks and completion of the shower and spray outlet disinfection tasks should be conducted on a weekly and quarterly basis respectively by the applicable Senior Maintenance Technician or Assistant Maintenance Manager/Team Leader. Any defects or omissions noted during these audits should be raised as a non-conformance.
- 6.6.3 A review of the logbook records to ensure that all tasks have been completed and recorded in accordance with the contract and that should take place for each property at least on an annual basis. This should be conducted by Chief Engineering Officer, Lead Engineer or Maintenance Manager.

Estates Safety & Compliance Review

- 6.6.4 An annual review of the legionella documentation and representative inspections of the water services should be performed for each property where King's is the duty holder, with a programme of alternative years to the risk assessment review. Where risk assessments are reviewed annually, the review should be conducted where practicable 6 months prior to the risk assessment review.
- An annual review of the PPP / PFI Buildings legionella control programme and NHS trust Embedded Space's legionella control programme is to be completed and recorded.

Water Treatment Contractor Review

- 6.6.5 On an annual basis the water treatment contractor will commission an independent review of all legionella documentation.

Contractor Competency Review

- 6.6.6 Routine review of site work completed by contracted service partners is to be conducted by Estates Safety & Compliance to ensure that they are in adherence to contractual arrangements and ensure competency of staff employed to complete the required work. The frequency and level of review will be dependent on the tasks completed by the contractor and the number of contractors working on the contract.
- 6.6.7 The details and scope of these reviews are detailed in E&F Code of Practice for the Control of Legionella Bacteria ([EF-ASU-02-PR08](#)). Action arising from all reviews must be completed in a timely manner with records kept.

7.0 RESPONSIBILITIES OF SUPPLIERS AND INSTALLERS

- 7.1.1 Anyone designing, supplying or installing water systems that may create a risk of exposure to legionella bacteria on behalf of the university must ensure, so far as is reasonably practicable that the water system is so designed and constructed that it will be safe and without risks to health when used at work; and:
- a) Provide adequate information for the user about the risk and measures necessary to ensure that the water systems will be safe and without risks to health when used at work.
 - b) This should be updated in the light of any new information about significant risks to health and safety that becomes available so that duty holders can ensure relevant changes are made to their risk assessment and controls.
- 7.1.2 Please refer to Responsibilities of manufacturers, importers, supplies and installers in L8 for further details and the requirements of this plan.
- 7.1.3 Guidance document [HSG274 Part 2](#) also provides advice on water system design and commissioning which should be adhered to for all works instructed by the university.
- 7.1.4 Where water systems are to be designed and installed within KCL space in healthcare settings, it needs to be ensured that water system design and commissioning requirements also complies with requirements in HTM04-01.
- 7.1.5 In addition to the guidance given in [HSG274 Part 2](#), the university requires the below documentation/certification to be contained within O&M Manuals produced as part of a project:
- Water systems should be cleaned, flushed and disinfected as specified in BS EN806, BSI PD 855468 and BS 8558. The water system should be pressure tested for leaks. Ideally with air unless coming immediately into service
 - Confirmation that the water supply meets the requirements of The Water Supply (Water Quality) Regulations 2018 or The Private Water Supplies (England) Regulations 2016 and must be wholesome at draw-off points
 - Product information sheets for all fittings and components to demonstrate that they comply with the Water Regulations Advisory Scheme (WRAS) approval scheme.
 - A full asset register of all water fittings and components, to include manufacturer, model, serial number (where applicable) and location.
 - As built domestic water system schematic

REFERENCES

- [The Health and Safety at Work etc. Act 1974](#)
- [The Control of Substances Hazardous to Health Regulations](#)
- [The Management of Health and Safety and Work Regulations \(as amended\)](#)
- [The Hazardous Waste Regulations \(as amended\)](#)
- [The Water Supply \(Water Quality\) Regulations](#)
- [Legionnaire's Disease: The control of legionella bacteria in water systems ACOP L8](#)
- [HSG274 Legionnaires' Disease: Technical Guidance Parts 2 and 3](#)
- BS EN 806 Specifications for installations inside buildings conveying water for human consumption.
- BS 8558 Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages Specification
- BS8580 Water Quality - Risk Assessment for Legionella Control – Code of Practice
- [The Water Supply \(Water Fittings\) Regulations and guide](#)
- [Minimising the risk of Legionnaires' disease TM13 - CIBSE](#)
- King's College London Documentation:
- King's College London Health and Safety Policy ([SP001](#))
- [Directorate of Estates & Facilities Health & Safety Arrangements](#)
- Estates and Facilities Directorate Code of Practice for Control of Legionella Bacteria ([EF-ASU-02-PR08](#))
- Estates and Facilities Directorate Written Schemes of Control
 - Guy's Campus ([EF-ASU-02-PR17](#))
 - Strand & Waterloo Campus ([EF-ASU-02-PR18](#))
 - Denmark Hill Campus ([EF-ASU-02-PR19](#))
 - King's Sport Grounds ([EF-ASU-02-PR53](#))
 - St Thomas' Campus ([EF-ASU-02-PR71](#))
 - King's Service Centre ([EF-ASU-02-PR72](#))
- King's College London Supporting Documentation/Records (KCL credentials required):
- Domestic Water Systems [e-Logbook](#)
- Little Used Outlet Flushing Log sheet Template ([EF-ASU-FO00010](#))
- Shower and Spray Outlet Descale Log sheet Template ([EF-ASU-FO00012](#))

APPENDICES

APPENDIX A DESIGN CONSIDERATIONS FOR WATER SYSTEMS

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APPENDIX A DESIGN CONSIDERATIONS FOR WATER SYSTEMS

A.1 GENERAL CONSIDERATIONS

- All water using equipment that can affect the water supply, the environment and the user shall be monitored regularly and be subjected to the following regime:
- All designs must be carried out and presented in accordance with all relevant and current Guidelines, British Standards and “best-practices”.
- The systems shall be carefully designed to eliminate or minimise aerosol production and excessive water retention. They must also be designed to be readily drained and cleaned.
- No materials used in construction shall include those that are known to harbour or provide nutrient for bacteria. Any materials that encounter the water in a hot and cold-water installation shall comply with the requirements of the Water Supply (Water Fittings) Regulations 1999. (The list of products and materials that have been assessed for compliance with the Water Supply (Water Fittings) Regulations 1999 requirements are listed in the current edition of Water Fittings and Materials Directory that is updated every six months. Further information on the selection of materials can be found in BS EN 806, BS8558, and BS6920.
- All redundant and dead-leg domestic water pipework must be removed with the “T section” removed. Where removal of the “T-section” cannot be removed, the redundant pipework must be cut back to its point of connection with the in-use water system. Dead-legs are considered as any length of pipework which is greater than twice the diameter of the pipework.

A.2 COLD WATER STORAGE TANKS

- Cold water storage tanks shall be constructed from non-deleterious materials that must be WRAS approved.
- Cold water storage tanks shall be designed in accordance with BS EN 806 and BS8558 (glass-reinforced plastic (GRP) tanks should comply with BS7491 Parts 1, 2 and 3), installed in appropriate and suitable locations to allow easy and safe access to facilitate routine inspection and maintenance.
- Sectional cold-water storage tanks shall be designed with external assembly flanges and self-draining profiles, since this arrangement facilitates easy cleaning of internal surfaces.
- Externally located cold water storage tanks shall be suitably protected from environmental conditions, particularly the local high ambient temperatures for all new buildings and, where practicable, for existing installations. Ventilation shall be achieved by means of louvered doors fitted with insect screens.
- Cold water storage tanks shall be protected from the ingress of light, insects and birds. Where viewing panels have been installed, tank rooms must be kept in darkness with windows blacked out and lighting left off when the room is not in use.
- Where new tanks are installed, clear viewing panels should not be installed. Legacy designs are to be covered over or replaced with opaque panels.

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- Cold water storage tanks shall be sized and arranged to minimise retention time of stored water (24hrs maximum), and therefore to increase the rate of stored water exchange.
- The design of level indicators and fill valves should not create a dead leg.
- All associated pipework and valves should be adequately insulated and clearly labelled to identify their purpose.
- Ideally, where cold water storage tanks are fitted, these should be linked “in parallel”, each feed to each tank shall be fitted with a water meter in order to allow for confirmation of equal and uniform usage from all tanks in the configuration.
- Where booster pumps are to be installed, a break tank will be required between the mains supply pipe and the pumps. This is required in order to comply with the Water Supply (Water Fittings) Regulations 1999 with regard to prevention of backflow. Control of the pump(s) should be fully automatic in operation and controlled by pressure sensors. Where two or more pumps are installed, the design flow should be achieved with one pump stationary (or out of service). Automatic control should be provided to control, cyclically and sequentially, all pumps to ensure that each is regularly brought into service (at least on a weekly basis).
- When it is deemed necessary and practicable, or where indicated, cold water storage tanks shall be upgraded, refurbished, modified or replaced so that they may comply with current Water Supply (Water Fittings) Regulations 1999. Following these works, each tank shall be cleaned and disinfected in accordance with BS EN 806 and BS8558 and L8 prior to it being allowed back into service and certificate placed in the site logbook.

A.3 HOT WATER VESSELS

- Hot water vessels shall be installed in appropriate and suitable locations to allow easy and safe access to facilitate inspection and maintenance.
- Where more than one hot water storage vessel or heating device is used, they shall be connected in parallel, taking care to ensure that the flow can be balanced so that the water temperature from all the hot water storage vessels exceeds 60°C at all times, except for short periods of high demand.
- The combined storage capacity and heater output must be sufficient to ensure that the outflow temperature, at continuous design flow (at least 20 minutes) from hot water storage vessels or other heaters, should not be less than 60°C. This applies to both circulating and non-circulating hot water systems.
- The positioning of the control and high limit thermostats, cold feed and return water connections must ensure that these temperatures are achieved.
- Hot water storage vessels should be fitted with a de-stratification pump, in order to avoid temperature stratification of the stored water. Some semi-storage/high-efficiency hot water storage vessels are supplied with an integral pump that circulates water in the hot water storage vessel. De-stratification pumps shall not be fitted to this type of unit.

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- Where the hot water vessel configuration does not allow for thermal stratification where confirmed by the risk assessor, this can be considered satisfactory with no de-stratification pumps.
- Hot water storage vessels must be capable of heating the entire contents to allow the entire contents of the cylinder to be brought up to a temperature of at least 60°C for one hour per day.
- The practice of terminating the air vent over the cold-water storage tank is discouraged. The vent should be arranged to discharge over a separate tundish arrangement, with visible Type A air gap, sited at a level that takes account of the hydrostatic head of the system. The hot water storage vessel or water heater should be provided with a suitable safety valve of appropriate size and vacuum release arrangement.
- Where water quality indicates the need, cathodic protection from galvanic action by means of sacrificial anodes shall be provided.
- A suitably sized drain valve shall be connected to the base of each hot water storage vessel (where practicable) and shall not create a dead leg.
- On new or refurbished installations, an inspection port shall be fitted to the side of the hot water storage vessel to allow internal inspection and cleaning.
- The use of swan neck valves should be discouraged, as these have the potential to create a dead-leg on the system.
- In the event of the installation of a new hot water storage vessel, these should be installed in the vertical upright position, and not horizontal. Where current vessels are installed in the horizontal position, these should be considered to be replaced or rotated if legionella bacteria are detected on the hot water system.

A.4 HOT AND COLD-WATER DISTRIBUTION SYSTEMS

- The design and installation of the hot and cold-water distribution system shall comply with the Water Supply (Water Fittings) Regulations 1999, BS EN 806, and BS8558.
- The design of the pipework shall ensure that there is no possibility of a cross-connection between installations conveying potable water and an installation containing non-potable water or water supplied from a private source (untreated). There shall be no possibility of backflow towards the source of supply from any tank, storage vessel or appliance, whether by back siphonage or otherwise.
- All cold distribution pipework, mains and tank down feeds shall be located, as far as is practicable, to minimise heat gains from their environment. Pipework shall not be routed through hot ducts or run adjacent to heat sources, such as radiators.
- All pipework shall be insulated, except for any exposed final connections to facilities, and should be arranged to eliminate or minimise dead legs.
- As far as possible, the objective shall be to design the cold-water systems to ensure that the inlet, outlet and surface water temperatures of cold-water storage tanks are not greater than 20°C, or two degrees above that measured at the main water meter. At cold water draw-off points, a temperature of less than

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20°C and less than 2°C above the temperature measured in the source cold water storage tanks shall be reached within one minute.

- Drinking water points must be supplied directly from the incoming mains water supply, boosted water service, or supplied by cold-water storage tanks that comply with the Water Supply (Water Fittings) Regulations, 1999 as amended.
- Stagnation shall be avoided. Hot and cold-water services shall be sized to provide sufficient flow at draw-off points. The aim shall be to promote turnover of water by means of the design of the distribution circuitry, adequate usage and avoidance of “disused” areas.
- Where installed, water supply to vending equipment shall be taken from a potable supply up stream of a regularly used outlet with the minimum of intervening pipe run i.e. less than 3 metres. The supply shall not be softened. Additionally, it shall be established that the usage is sufficient to avoid deterioration in water quality. For example, the inlet water temperature is less than 20°C and the outlet does not remain unused.
- The equipment shall be positioned so that the warm air exhaust does not impinge directly on taps or hoses supplying cold water.
- The domestic hot water system shall not be used for heating purposes. This includes all radiators, towel rails, heated bedpan racks etc., whatever the pipework configuration.
- Central “common blending” systems shall not be used unless all showers are used on a regular basis, since the length of distribution pipework containing water in the temperature range that supports bacterial growth and proliferation would far exceed the maximum permissible lengths mentioned above.
- Where new water systems are installed, it should be ensured that suitably accessible isolation valves are installed as close to each outlet as reasonably practicable.
- Domestic water outlets where fitted, should be of suitable design to allow installation of legionella filters if required.

A.5 THERMOSTATIC MIXING VALVES/TAPS

- Thermostatic mixing taps (TMTs) will be considered above thermostatic mixing valves (TMVs).
- TMTs/TMVs will only be installed where advocated by risk assessment of the potential scalding risk.
- All TMVs/TMTs shall be fitted with strainers, but only if a regular cleaning regime can be guaranteed, isolation valves and non-return valves.
- The circulating hot water return pipework must run as close as possible to the TMV/TMT
- Blended water delivered from a TMV/TMT is to be at a temperature of 41°C (±2°C).
- It must be ensured that that TMVs and TMTs are not installed in conjunction at an outlet.
- Where TMVs are installed:
 - The pipe-work length from the TMV to the outlet must be as short as possible. The valve must be installed within 2m from the terminal fitting.

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- All TMVs must be accessible (as far as reasonably practicable) and easy to clean, maintain and inspect.
- A single TMV must only serve one outlet.

A.6 FIRE HOSE REELS

- Where the fire and domestic supplies share the same line, each hose-reel spur shall be fitted with a double check valve or better. It is important, however, to ensure that the valves are fitted as close to the domestic line as possible in order to ensure that the dead-leg up-to the valves is kept as small as possible.
- Where the installation of double check valves or equivalent/better back flow prevention is not practicable on fire hose reels, each unit shall be subjected to a weekly flushing regime in order to minimise stagnation and the potential for increased bacterial proliferation.

A.7 SHOWERS

- Without limitation, all showers must be subject to thorough cleaning and disinfection at least on a quarterly basis in line with the L8 and HSG274 document.
- Central “common blending” shower-block systems shall not be used and all pipe-work length from the TMV to the showerhead should be as short as possible.
- Each shower must be fitted with a dedicated TMV and pipe-work length from the TMV to the showerhead shall be kept to a minimum. The valve must be installed within 2m from the terminal fitting.
- Where “common blending” shower-block systems are already in place and showers are not in regular use each system shall be fitted with a solenoid valve (at the furthest point from the mixer valve), programmed to automatically purge water for a three-minute period each day.
- Care must be taken when selecting showerheads for the purpose of water saving due to the implications on the control of legionella.
- All showers in non-residential properties must be flushed at least weekly.
- Each TMV, including hot and cold-water feeds, must be fully accessible for cleaning, maintenance, testing and inspection.
- All TMVs shall be fitted with strainers, isolation valves and non-return valves
- The circulating hot water return pipework must run as close as possible to the shower
- Hot water delivered from a shower to be at a temperature of 41°C ($\pm 2^{\circ}\text{C}$).
- All pipework shall be insulated, except for any exposed final connections to facilities, and should be arranged to eliminate or minimise dead-legs.
- Consideration should be given to self-flushing fittings which are validated and linked to the BMS to provide evidence

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- Shower heads/spray plates must be able to be fully disassembled (for cleaning and descaling purposes) and anti-microbial.
- Where showers are installed, or refurbished, the shower fittings installed should be compatible to ensure they can be replaced with legionella filters.
- Where showers are newly installed or refurbished, it should be considered to installing electric showers fed from the mains water service rather than mixer showers to reduce the risk.
- If installed, legionella filtering shower heads must be integral and replaced at least every 30 days

A.8 FLEXIBLE HOSES

- The use of EPDM (Ethylene Propylene Diene Monomer) flexible braided rubber hoses shall be prohibited in the installation of new domestic water facilities. This applies to flexible hoses from mixed domestic water supplies as well as to separate hot and cold-water systems and feeds. This does not apply to primary heating circuits, sealed chilled water systems or shower hoses (between mixer and showerhead).
- Where flexible hoses are already in situ and require replacement (e.g. due to faults or leakage) fixed pipework, constructed from materials in use within the system shall be installed. Additionally, where legionella positive samples have been detected, all flexible hoses shall be replaced as above.
- If fixed pipework cannot be installed, it is permissible as a last resort for WRAS approved non-EPDM flexible pipework such as PE (polyethylene), PEX (cross-linked polyethylene), LLDPE (linear low-density polyethylene) and PVC C (post-chlorinated PVC) to be used. Where non-EPDM products are installed, these must be clearly marked, specified within the asset register and certification to confirm their WRAS approval and composition must be maintained by the maintenance team. Care should be taken during installation to avoid kinking or distortion.
- Six monthly routine inspection of existing flexible hosing is conducted as part of the control scheme.

A.9 CLOSED WATER SYSTEMS

- Where domestic water systems are providing make-up to closed water systems either via pressurisation units, or quick fill supplies, a suitable non return valve is to be installed as close as practicable to the point at which the supply line tees off from the domestic water system.
- Where quick fill lines are installed, these should be fitted so that this supply can be disconnected from the closed water system when not required.
- Suitable back flow requirements should be complied with in accordance with Water Supply (Water Fittings) Regulations 1999, where closed systems are installed to prevent contamination to the domestic water systems.