

Part 3

Procedures for the Risk Assessment, Environmental Investigation and Control and Prevention of Legionella in Water Systems

25. Introduction

This part of the guidelines outline the general principals and procedures that should be followed in order to carry out a risk assessment of the control measures against the proliferation of Legionella bacteria in an establishment such as a hotel. It must be emphasised that, for the effective prevention of legionnaires' disease, risk assessments and control measures must be implemented proactively and not merely in response to a case or cluster of cases of legionnaires' disease. Consequently if a single case is associated with the establishment it should only be necessary to ensure that an adequate up-to-date risk assessment is in place and check that all the control measures are operating correctly and consistently. However following a cluster of cases it will be necessary to carry out a new thorough risk assessment.

This part should be read in conjunction with Supplement 1 that provides more technical information on the methods available to control the growth of Legionella in different kinds of water systems. Although this document deals primarily with travel associated legionnaires' disease and is therefore concerned mostly with hotels; the risk assessment procedures and technical guidance can be applied to all kinds of premises.

26. Scope

These guidelines apply to the control of Legionella bacteria in any undertaking involving a work activity and to premises controlled in connection with a trade, business or other undertaking where water is used or stored. For example, hotels, holiday apartments, camp sites, cruise ships, leisure centres, trade shows and factories. These guidelines should be read in conjunction with the technical notes (Supplement 1).

A reasonably foreseeable risk of exposure to Legionella bacteria exists in:

- a) Water systems incorporating a cooling tower;
- b) Water systems incorporating an evaporative condenser;
- c) Hot and cold water systems;
- d) Natural thermal springs and their distribution systems;
- e) Spa pools;
- f) Humidifiers;

- g) Other plant and systems containing water that is likely to exceed 20°C and which may release a spray or aerosol (i.e. a cloud of droplets and/or droplet nuclei) during operation, demonstration or when being maintained, for example industrial water systems and horticultural sprinkler systems.

Not all of the systems listed above will require elaborate assessment and control measures. A simple risk assessment may show that the risks are low and in such case no further action will be necessary.

A water system includes all plant/equipment and components associated with that system, e.g. all associated pipework, pumps, feed tanks, valves, showers, heat exchangers quench tanks, chillers etc. It is important that the system is considered as a whole and not, for example, the cooling tower in isolation. Deadlegs and parts of the system used intermittently, e.g. sections of hotels that are closed in the low season, also need to be included as part of the system since they can create particular problems with microbial growth going unnoticed. Once brought back on-line they can cause heavy contamination, which could overload the water treatment regime and result in dissemination of Legionella throughout the system

Other systems, such as humidifiers and air washers, spa baths and pools, car/bus washes, wet scrubbers, industrial water systems, fountains and water features, also need to be considered.

27. Identification and assessment of the risk

A survey is required to identify and assess the risk of exposure to Legionella bacteria from water systems on the premises and any necessary precautionary measures. The individual whose duty it is to have the assessment carried out is:

- a) The employer, where the risk from their undertaking is to their employees or to others; or
- b) A self-employed person, where there is a risk from their undertaking to themselves or to others; or
- c) The person who is in control of premises or systems in connection with work where the risk is present from systems in the building (e.g. where a building is let to tenants but the landlord retains responsibility for its maintenance); or
- d) The person who is in control of premises used for overnight accommodation, such as hotels, holiday apartments, campsites and cruise ships where the risk is present from water systems in the building.

The person conducting the assessment must be competent to assess the risks of exposure to Legionella bacteria in the water systems present in the premises and the necessary control measures (e.g. a microbiologist, environmental health officer or water engineer with this specific expertise).

The assessment should include a full inspection to identify and evaluate potential sources of risk and:

- a) The particular means by which exposure to Legionella bacteria is to be prevented;
- or
- b) If prevention is not reasonably practicable, the particular means by which the risk from exposure to Legionella bacteria is to be controlled.

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

28. Carrying out a risk assessment

The risk of a person being infected with Legionella depends on a number of factors. These include:

- a) The presence of Legionella bacteria;
- b) Conditions being suitable for multiplication of the organisms for example a suitable temperature (20°C to 50°C) and a source of nutrients such as sludge, scale, rust, algae and other organic matter;
- c) A means of creating and disseminating inhalable droplets such as the aerosol generated by operating a tap, shower or cooling tower;
- d) The presence (and numbers) of individuals who may be exposed,
- e) The vulnerability of these individuals e.g. the elderly.

While there will inevitably be common factors associated with the many and varied types of premises being assessed, the individual nature of each site should be taken into account. In complex systems or premises, a site survey of all the water systems should be carried out and should include an asset register of all associated plant, pumps, strainers and other relevant items. This should include an up-to-date drawing/diagram showing the layout of the plant or system, including parts temporarily out of use. A schematic diagram would be sufficient. It should then be decided which parts of the water system, for example which specific equipment and services pose a risk to those at work or other persons.

The following list contains some of the factors that should be considered, as appropriate, when carrying out the assessment:

- a) The source of system supply water, for example, whether from a mains supply or not;
- b) Possible sources of contamination of the supply water within the premises before it reaches the cold water storage cistern, hot water storage heater, cooling tower or any other system using water that may present a risk of exposure to Legionella bacteria;
- c) The normal equipment operating characteristics;
- d) Unusual, but reasonably foreseeable, operating conditions, for example, breakdowns;
- e) The position of air intakes for buildings which should not be located near to cooling tower exhausts.

A fully documented record of the risk assessment should be kept and where there is a risk the record of the assessment should be linked to other relevant health and safety records.

Employers are required to consult employees or their representatives on the identified risks of exposure to Legionella bacteria and on the measures and actions taken to control the risks.

It is essential that the effectiveness of the control measures is monitored and decisions made on the frequency and manner of this monitoring.

The assessment should be reviewed regularly (at least every two years) and in any case whenever there is reason to suspect that it is no longer valid. This could occur when due to changes to the water system or its use or the results of checks indicate that control measures are no longer effective.

29. Managing the risk: management responsibilities, training and competence

Where the assessment has identified a risk and it is reasonably practicable to prevent exposure or control the risk from exposure, the person on whom the duty falls (see paragraph 27 above) should appoint a person or persons to take day to day managerial responsibility and to provide supervision for the implementation of precautions for controlling any identified risk from Legionella bacteria. The appointed 'responsible person' should be a manager, director, or have similar status and sufficient authority, competence and knowledge of the installation to ensure that all operational procedures are carried out in a timely and effective manner. If a duty-holder is self-employed or a member of a partnership, and is competent, they may appoint themselves. The responsible person should have a clear understanding of their duties and the overall health and safety management structure and policy in the organisation.

Inadequate management, lack of training and poor communication have all been identified as contributory factors in outbreaks of legionnaires' disease. Persons who carry out the assessment and who draw up and implement precautionary measures should have such ability, experience, instruction, information, training and resources as to allow them to carry out their tasks competently and safely. In particular, they should know:

- a) Potential sources and the risks they present;
- b) Measures to be adopted, including precautions to be taken for the protection of people concerned, and their significance;
- c) Measures to be taken to ensure that controls remain effective, and their significance.

Where the above expertise is not possessed by the person or persons appointed under paragraph 29, it may be necessary to enlist help and support from outside the organisation. In such circumstances, the person or persons appointed under paragraph 29 should take all reasonable steps to ensure the competence of those

carrying out work who are not under their direct control and that responsibilities and lines of communication are properly established and clearly laid down.

Management and communication procedures should be periodically reviewed as appropriate.

30. Competence

Those who are appointed to carry out the control measures and strategies should be suitably informed, instructed and trained and their suitability assessed. They should be properly trained to a standard that ensures that tasks undertaken are carried out in a safe, technically competent manner. Regular refresher training should be undertaken and records of all initial and refresher training need to be maintained. Although training is an essential component of competence, it is not the only component - it is a product of sufficient training, experience, knowledge and other qualities that are required to undertake a job safely. Competence is dependent on the needs of the situation and the nature of the risks involved.

31. Implementation of the control scheme

The implementation of the water system control scheme should be regularly and frequently monitored and all persons involved in any related operational procedure should be properly supervised. Staff responsibilities and lines of communication should be properly defined and clearly documented.

Arrangements should be made to ensure that appropriate staff levels are maintained during all hours when complex water systems are in operation. The precise requirements will depend on the nature and complexity of the water system. Appropriate provision should be made to ensure that the responsible person or an authorised deputy can be contacted at all times.

Call out arrangements for persons engaged in the management of water systems that operate automatically need to be similarly maintained. Details of the contact arrangements for emergency call out personnel should be clearly displayed at access points to all automatically or remotely controlled water systems.

Communications and management procedures are particularly important where several people are responsible for different aspects of the operational procedures. For example, responsibility for applying precautions may change when shift work is involved, or the person who monitors efficacy of a water treatment regime may not be the person who applies it. In such circumstances responsibilities should be well defined in writing and understood by all concerned. Lines of communication should be clear, unambiguous and audited regularly to ensure they are effective. This also applies to outside companies and consultants who may be responsible for certain parts of the control regime.

The employment of contractors or consultants does not absolve the duty holder (as defined in paragraph 27 above) of responsibility for ensuring that control procedures are carried out to the standard required to prevent the proliferation of

Legionella bacteria. Organisations should make reasonable enquiries to satisfy themselves of the competence of contractors in the area of work before entering into contracts for the treatment, monitoring, and cleaning of the water system, and other aspects of water treatment and control.

32. Preventing or controlling the risk from exposure to Legionella bacteria

Once the risk has been identified and assessed, a written scheme should be prepared for preventing or controlling it. In particular, it should contain such information about the system as is necessary to control the risk from exposure.

The scheme should specify measures to be taken to ensure that it remains effective, together with remedial action required in the event that the scheme is shown not to be effective. The scheme should include:

- a) The up-to-date plan showing layout of the plant or system, including parts temporarily out of use (a schematic plan would suffice);
- b) A description of the correct and safe operation of the system;
- c) The precautions to be taken;
- d) The checks to be carried out to ensure efficacy of scheme and the frequency of such checks.

The primary objective should be to avoid conditions that permit Legionella bacteria to proliferate and to avoid creating a spray or aerosol. If it is practicable to prevent a risk by replacing a piece of equipment that presents a risk with one that does not, this should be done.

In general, proliferation of Legionella bacteria may be avoided by:

- a) Avoiding water temperatures between 20°C and 50°C. Water temperature is a particularly important factor in controlling the risks and water should be either below 20°C or above 50°C;
- b) Avoiding water stagnation. Stagnation may encourage the growth of biofilm (slimes that form on surfaces in contact with water) which can harbour Legionella bacteria and provide local conditions that encourage its growth;
- c) Avoiding the use of materials in the system that can harbour or provide nutrients for bacteria and other organisms e.g. natural rubber washers and hoses;
- d) Keeping the system clean to avoid the build up of sediments which may harbour bacteria (and also provide a nutrient source for them);
- e) The use of a suitable water treatment programme where it is appropriate and safe to do so; and
- f) Ensuring that the system operates safely and correctly and is well maintained.

The scheme should give details on how to use and carry out the various control measures and water treatment regimes including:

- a) The physical treatment programme for example, the use of temperature control for hot and cold water systems;

- b) The chemical treatment programme, including a description of the manufacturer's data on effectiveness, the concentrations and contact time required;
- c) Health and safety information for storage, handling, use and disposal of chemicals;
- d) System control parameters (together with allowable tolerances); physical, chemical and biological, together with measurement methods and sampling locations, test frequencies and procedures for maintaining consistency;
- e) Remedial measures to be taken in the event that the control limits are exceeded including lines of communication;
- f) Cleaning and disinfection procedures.

There should also be a description of the correct operation of the water system plant including:

- a) Commissioning and recommissioning procedures;
- b) Shutdown procedures;
- c) Checks of warning systems and diagnostic systems in the event of system malfunction;
- d) Maintenance requirements and frequencies;
- e) Operating cycles - to include when the system plant is in use or idle.

33. Review of control measures - monitoring and routine inspection

If precautions are to remain effective the condition and performance of the system will need to be monitored. This should be the responsibility of the responsible person or, where appropriate, an external contractor or an independent third party and should involve:

- a) Checking the performance of the system and its component parts;
- b) Inspecting the accessible parts of the system for damage and signs of contamination;
- c) Monitoring to ensure that the treatment regime continues to control to the required standard.

The frequency and extent of routine monitoring will depend on the operating characteristics of the system, but should be at least weekly.

Testing of water quality is an essential part of the treatment regime, particularly in cooling towers. It may be carried out by a service provider e.g., a water treatment company or consultant, or else by the operator, provided they have been trained to do so and are properly supervised. The type of tests required will depend on the nature of the system.

The routine monitoring of general bacterial numbers (total viable count) is also appropriate as an indication of whether microbiological control is being achieved. This is generally only undertaken for cooling towers and spa pools rather than hot and cold water systems. Periodic sampling and testing for the presence of

Legionella bacteria may also be appropriate as an indication that adequate control is being achieved.

However, reliably detecting the presence of legionella bacteria is technically difficult and requires specialist laboratory facilities. The interpretation of results is also difficult; a negative result is no guarantee that legionella bacteria are not present. Conversely, a positive result may not indicate a failure of controls, as legionella are present in almost all natural water sources.

A suitably experienced and competent person should interpret the results of monitoring and testing. Where necessary, any remedial measures should be carried out promptly.

34. External audit

An external competent person should audit the risk assessment and operation of the control measures periodically (at least every two years).

35. Record keeping

The person or persons appointed under paragraph 33 shall ensure that appropriate records are kept, including details of:

- a) The person or persons responsible for conducting the risk assessment, managing, and implementing the written scheme;
- b) The significant findings of the risk assessment;
- c) The written scheme required under paragraph 32 and details of its implementation;
- d) The results of any monitoring, inspection, test or check carried out, and the dates. This should include details of the state of operation of the system, i.e. in use / not in use.

Records kept in accordance with paragraph 34 should be retained throughout the period for which they remain current and for at least two years after that period. Records kept in accordance with paragraph 35 (d) should be retained for at least five years.

36. Responsibilities of manufacturers, suppliers and installers

Outbreaks of legionnaires' disease have been associated with faulty installation of equipment used in hotels (19). Whoever designs, manufactures, imports or supplies water systems that may create a risk of exposure to Legionella bacteria should, so far as is reasonably practicable:

- a) Ensure that the water system is so designed and constructed that it will be safe and without risks to health when used at work;
- b) 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. This should be updated in the light of any new information about significant risks to health and safety that becomes available.

Suppliers of products and services, including consultancy and water treatment services, aimed at preventing or controlling the risk of exposure to legionella bacteria, should, so far as is reasonably practicable:

Ensure that measures intended to control the risk of exposure to legionella bacteria are so designed and implemented that they will be effective, safe and without risks to health when used at work;

- a) Provide adequate information on the correct and safe use of products, taking into account the circumstances and conditions of their use;
- b) Ensure that any limitations on their expertise or on the products or services they offer are clearly defined and made known to the person upon whom the statutory duty falls or the person(s) appointed to take managerial responsibility;
- c) Ensure that any deficiencies or limitations which they identify in occupier's systems or written scheme to control the risk of exposure to Legionella bacteria are made known to the person upon whom the statutory duty falls or the person(s) appointed to take managerial responsibility;
- d) Ensure that their staff has the necessary ability, experience, instruction, information, training and resources to carry out their tasks competently and safely.

All water systems should be properly installed, and commissioned as appropriate.