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### **Background to the disease and organisms**

Legionnaires' disease is a potentially fatal form of pneumonia which can affect anybody, but which principally affects those who are susceptible because of age, illness, immunosuppression, smoking, etc. It is caused by the bacterium *legionella pneumophila* and related bacteria. Legionella bacteria can also cause less serious illnesses which are not fatal or permanently debilitating.

On average there are about 200-250 reported cases of Legionnaires' disease each year in the UK of which half are contracted abroad. It is thought the number of cases is underestimated because the symptoms are similar to other illnesses and cases are not generally reported.

Outbreaks have been associated with cooling tower systems, hot and cold water systems in factories, hotels, hospitals and other establishments. Cases of Legionnaires' disease have occurred among staff in the workplace (factories, offices, shops and hospitals); visitors (delivery drivers) and members of the public (patients, hotel guests or passers-by).

Legionellosis (including Legionnaires' disease) is contracted when inhaling tiny droplets of water contaminated with the bacteria. Sources of droplet formation include cooling towers, showers, spray taps, water features, sprinkler systems, wash systems, hoses and any other similar spray forming device. It causes a variety of symptoms and can be fatal in about 12% of reported cases. Some groups are higher risk e.g. men, smokers, age over 45, and those with certain existing illnesses.

### **Natural history of the legionella bacterium**

Legionella bacteria are common and can be found naturally in environmental water sources. They may eventually colonise man-made water systems and can multiply where there are ideal growth conditions, e.g. warm temperature between 20 and 45°C and a supply of nutrients such as other bacteria, sediment, sludge and scale. Biofilms help protect legionella from biocides and temperature control.

The bacteria remain dormant in cool temperature and do not appear to multiply below 20°C. They will not survive above 60°C. They are more virulent at 37°C (human body temperature) than at 25°C.

## **Legislation - Health and Safety Law and Guidance**

- The Health and Safety at Work Act 1974
- Management of Health & Safety at Work Regs. 1999
- The Approved Code of Practice (ACoP L8): "Legionnaires' Disease - The Control of Legionella Bacteria in Water Systems".
- HSG274: Legionnaires' Disease: Technical Guidance
- COSHH Regulations – 2002
- Notification of Cooling Towers and Evaporative Condensers Regulations 1992

## **Risk Assessment**

The ACoP L8 Para 23 states that 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 services; and
- d) other plant and systems containing water which is likely to exceed 20°C and which may release a spray or aerosol during operation or when being maintained.

The ACoP L8 Para 41 states that a number of factors are required to create a risk of acquiring Legionellosis, such as:

- a) the presence of legionella bacteria;
- b) conditions suitable for multiplication of the organisms, e.g. suitable temperature (20°C - 45°C) and a source of nutrients e.g. sludge, scale, rust, algae and other organic matter;
- c) a means of creating and disseminating breathable droplets, e.g. the aerosol generated by a cooling tower or shower; and
- d) the presence (and numbers) of people who may be exposed, especially in premises where occupants are particularly vulnerable, e.g. healthcare.

The Risk Assessment is focussed on establishing whether there is a risk to health and if so what control measures are needed. ACoP L8 para 42 lists some factors to consider. These relate to the water systems and their operation.

## **Review of Risk Assessment**

The ACoP L8 Para 47 states the assessment should be reviewed regularly and whenever there is reason to suspect that it is no longer valid. An indication of when to review the assessment and what needs to be reviewed should be recorded. This may result from, e.g.:-

- a) changes to the water system or its use;
- b) changes to the use of the building in which the water system is installed;
- c) the availability of new information about risks or control measures;
- d) the results of checks indicating that control measures are no longer effective;
- e) changes to key personnel; and
- f) a case of Legionnaires' Disease / Legionellosis is associated with the system.

## **Responsible Persons - ACoP L8 paras 48-56**

ACoP L8 requires the appointment of a responsible person having sufficient authority, competence and knowledge. Clarity of duties, contact arrangements and defined lines of communication are important. These are to be understood, documented and audited regularly.

## **Responsibilities and competence of responsible person (and deputy)**

### ***Para 36 ACoP L8***

It is the duty of the Responsible Person (see para 48) to make reasonable enquiries to ensure that organisations such as water treatment companies or consultants, together with personnel from the occupier's organisation, are competent and suitably trained and have necessary equipment to carry out their duties within the written scheme in a safe and adequate manner.

### ***Para 48 ACoP L8***

The person on whom statutory duty falls (see para 28) should appoint a person or persons to take managerial responsibility and to provide supervision for the implementation of the precautions.

### ***Para 49 and 35 ACoP L8***

Persons who carry out the Risk Assessment and who draw up and implement precautionary measures should have such ability, experience, instruction, information, training and resources to enable them to carry out their task competently and safely.

Where the above expertise is not possessed by the person or persons appointed under para 48, it may be necessary to enlist help and support from outside the organisation. In such circumstances, the person or persons appointed under para 48 should take all reasonable steps to ensure the competence of those carrying out work who are not under their direct control and that their lines of communication are properly established and clearly laid down.

### ***Para 51 ACoP L8***

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.

### ***Para 52 ACoP L8***

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

### ***Para 53 ACoP L8***

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

### ***Para 54 ACoP L8***

Appropriate arrangements should be made to ensure that the responsible person or an authorised deputy can be contacted at all times.

## **Legionella Policy**

*A summary of the requirements for control of Legionella focussing on guidance when discovering high bacteria counts in water systems*

- A good working knowledge of Approved Code of Practice and Guidance L8, “Legionnaires’ Disease – The Control of *Legionella* Bacteria in Water Systems” (ACoP) is required.
- Each system must have a current Risk Assessment (reviewed as necessary)
- Staff carrying out *Legionella* control work must be competent to do so.
- The Log Book should be audited regularly (quarterly or six-monthly).
- The control programme must be reviewed on an annual basis.
- The Log Book should include cleaning procedures as appendices.
- A Method Statement is required for cleaning and chlorination procedures.

*What to do when finding Legionella in water systems.*

This policy is designed to give guidance to field personnel when discovering high bacteria counts in water systems relevant to our everyday operations.

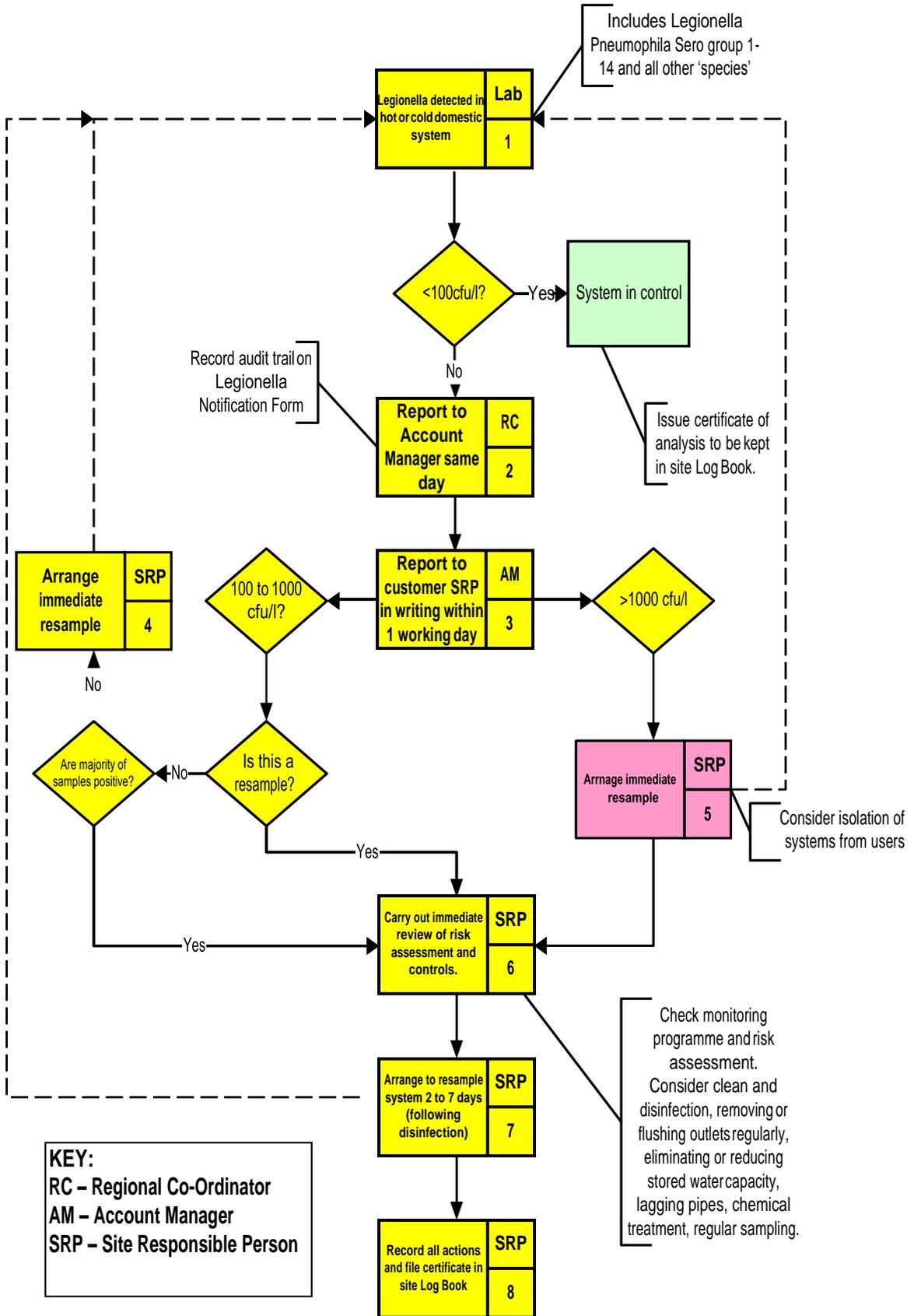
## **Domestic Systems**

### **ACTION TO BE TAKEN IN THE EVENT OF LEGIONELLA BEING ISOLATED**

Legionella sampling is recommended in systems treated with biocides where temperatures are reduced or levels of chlorine dioxide are below 0.50ppm.

The ACoP L8 & HSG 274 part 2 provides guidance regarding action levels following Legionella sampling. This is summarised as follows:

# Legionella Policy



## **DOMESTIC WATER SYSTEM MONITORING CHECKS**

### **Daily Chlorine Dioxide Dosing Equipment Check**

Check that the Chlorine Dioxide dosing systems are functional and chemical levels are above 10%

### **Weekly Checks of Little-Used Outlets**

Flush through and purge to drain, or purge to drain immediately before use, without release of aerosols. A live list of little used outlets that will be updated as situations change. These outlets will be flushed for 2 minutes to ensure pipe work if flushed through. This will only be increased should the outlet have a known problem and it is deemed necessary.

### **Weekly Checks of Calorifier Operating Temperatures**

Check calorifier temperatures to ensure that they are operating correctly and reaching internal operating temperatures of  $>60^{\circ}\text{C}$  for a minimum of one hour each 24 hour period.

### **Weekly Checks of Cold Water Storage Tank Temperatures**

CWST to be checked to ensure incoming temperatures are  $<20^{\circ}\text{C}$  and stored water is also  $<20^{\circ}\text{C}$ . This is to check that stored water is being used within 24 hour period by demonstrating no significant temperature differences between incoming mains and stored water.

### **Monthly Temperature Checks at Calorifiers Flow & Return Pipework**

Look at the temperature gauge on the calorifier and record the reading. If the temperature is below  $60^{\circ}\text{C}$  then increase the thermostat setting. Monitor flow temperature  $>60^{\circ}\text{C}$  and return temperatures  $>50^{\circ}\text{C}$  to and from calorifier.

### **Monthly Temperature Checks of Hot / Cold Sentinel Taps**

Allow the outlet water to run for one minute before recording the temperature. If the hot water is not distributed between  $50 - 55^{\circ}\text{C}$  then the calorifier thermostat may need to be adjusted. The cold water temperature should be ideally be below  $20^{\circ}\text{C}$  although the presence of Chlorine Dioxide at  $>1.5 \text{ mg/litre}$  is the primary control in these systems.

## **DOMESTIC WATER SYSTEM MONITORING CHECKS continued**

### **Monthly Chlorine Dioxide Checks and Sampling**

To demonstrate good reserves of Chlorine Dioxide >0.15 mg/l but <0.5 mg/l. Samples to be taken in sterile containers and submitted to UKAS Accredited Laboratory in accordance with good practice. Samples to be analysed for Total Viable Count (TVC) and results compared to Guidelines for Drinking Water. *(Although CWST do not supply drinking water this is good practice to ensure good water quality)* This is to demonstrate good control is being maintained by the chemical dosing across the systems it is being used on.

### **Monthly Blowdown of Calorifier Drains**

Open the drain on the bottom of the calorifier and allow to run until no debris can be observed.

### **Quarterly Dipslides from Calorifier Drains**

Remove cap / tongue unit from the tube and, without touching the gel, immerse the tongue in the fluid to be tested for about ten seconds, or hold the slide under running liquid or spray so that both sides are covered. Allow excess fluid to drain for a few seconds. Replace in tube, seal firmly, label as required and incubate upright for 48 hours at 30°C. Conditions may be altered to suit particular applications.

Compare the incubated slide to the growth charts provided reading the results for fluids or surfaces as appropriate. Note that very high levels of growth may merge into a solid mass, and could appear as a nil result. Compare the slide to a sterile example if this may be the case. Refer to product description for growth on selective agars.

Store in a cool dry place. Optimum conditions are 8 - 15°C. Slides remain usable as long as there is no visible contamination and the agar remains smooth and attached to the slide. A small amount of water may collect in the tube, this is normal, provided the agar fills the tray. Used slides should be incinerated, autoclaved or soaked in disinfectant for several hours before disposal.

### **Quarterly Clean & Chlorination of Showerheads & Hoses**

Showerheads and hoses are removed on a quarterly basis and all debris removed, using brushes, scrapers and descaler if necessary. The showerheads and hoses are then soaked for one hour in a solution containing 50 ppm Free Residual Chlorine before being replaced.

## **DOMESTIC WATER SYSTEM MONITORING CHECKS continued**

### **Six-Monthly Cold Water Tank Inspection & Temperature and Ball Valve Checks**

This should comprise visual inspection of the cold water storage tank to check the condition of the inside of the tank and the water within it. The lid should be in good condition and fit closely. The insect screen on the water overflow pipe should be intact and in good condition. The thermal insulation on the cold water storage tank should be in good condition so that it protects it from extremes of temperature. The water surface should be clean and shiny and the water should not contain any debris or contamination. The cold water storage tank should be cleaned, disinfected and faults rectified if considered necessary. If debris or traces of vermin are found, the inspection should be carried out more frequently.

The water temperature is checked at a point remote from the ball valve and the mains water temperature at the ball valve on a six-monthly basis.

### **Annual Temperature Checks from a Representative Number of Outlets**

On a monthly rotational period all non-sentinel outlets will be checked for temperature and Chlorine Dioxide in the same method as the sentinel points. This is to ensure that over a 12 month period all outlets on site will be checked for compliant controls. This monthly rotational method also gives a good indication of the correct function of all flow and return pipework on complex looped systems, and demonstrates a good monthly representative snap shot of all temperatures and Chlorine Dioxide levels across site.

### **Annual Clean & Chlorination of Cold Water Storage Tanks or as Required**

*Method for Tank Clean & Disinfection Using Microchem M381 Silver Peroxide*

#### **1. DRAIN TANK**

Label all outlets using H<sub>2</sub>O Chemicals Ltd warning labels. The cold water storage tank is first drained - this is carried out by either opening the drain valve or by using a submersible pump and emptying to drain. Once drained, the outlets and drains are closed.. Carry out cleaning and chlorination as per ACoP L8 (shown below).

#### **2. TANK ENTRY**

If entry into the tank is necessary then two men must be present. (If designated as a full confined space then need to specify equipment required (e.g. harness, gas monitor, escape set etc.)

The additional person should remain outside the tank ensuring the safety of the person inside the tank at all times.

### 3. CLEANING

The tank is then manually scraped clean and the floors and walls of the tank are vacuumed using a wet-vac. All visible dirt and debris should be removed. Any damage, any signs of corrosion or flaking and any deficiencies such as missing rodent screens, cross flow, vents should all be noted the Visit Report Sheet.

### 4. DISINFECTION

Treat to 200 ppm Microchem M381 (200mls of M381 per cubic metre of system) or 100 ppm of Hydrogen peroxide. In large tanks, use a sump pump to circulate water from one end of the vessel to the other whilst adding Microchem M381, or some similar method of mixing. Test concentration using Peroxide test strips. If below 100 ppm, calculate additional Microchem M381 required as follows:

- Microchem M381 required (ml) =  $(100 - \text{test concentration}) \times 2.0 \times \text{water volume m}^3$ .

### 5. SYSTEM RECOMMISSIONING

When system has soaked for 1 hour, test using Peroxide test strips to ensure concentration has not dropped below 50 ppm. If it has, redo steps 2 to 5

Once the system has been thoroughly flushed, the tank is left refilling; all notices are removed and the system is returned for use. The responsible person on-site will be asked to sign the report produced by H2O Chemicals Ltd to signify completion of the works. H2O Chemicals Ltd will forward a signed Certificate of Disinfection for inclusion into the site Log Book.

### **Annual Visual Check of Internal Surfaces of Calorifiers**

Where possible the calorifier should be drained and the access panel removed to determine the extent of scale and sludge build-up and the requirement for remedial work.

### **Adiabatic Cooling System**

Following a calendar year of no use of the wet cooling system due to its disconnection, it has now been decided that this system will remain disconnected and will now function only as an air cooled chiller. Due to this there is now no requirement for legionella checks as there is no water use in the system.

## Roles and Responsibilities

Schedule of PPM's for Legionella prevention. Effective 12/1/15									
PPM Description	Daily	Weekly	Twice Weekly	Monthly	Quarterly	6 Monthly	Annual	Assigned To	Done
Temperature checks on all Sentinels				♦				WCS Group	✓
Annual temperature checks on all none - Sentinels							♦	WCS Group	✓
Clean and Chlorination of Cold Water Storage							♦	WCS Group	✓
CWST Sampling/Bacterial Analysis						♦		WCS Group	✓
					♦			WCS Group	✓
Calorifier Flow and Return Temp Check				♦				WCS Group	✓
Chlorine Dioxide checks at sentinel outlets				♦				WCS Group	✓
Dipslides from Calorifier Drains					♦			WCS Group	✓
TMV Service						♦		WCS Group	✓
CWST Inspection and temp Checks						Dec/Jul		WCS Group	✓
Flushing of all Lab outlets on site		♦				♦		S.Bestwick	✓
Tenants PPM - Little used outlets				♦				S.Bestwick	✓
Visual inspection of Insulation							♦	CBRE	✓
Visual inspection of Tanks							♦	CBRE	✓
Visual Inspection of Calorifiers							♦	CBRE	✓
Flush Base of Calorifiers					♦			CBRE	✓
Water Softener Disinfection							♦	CBRE	✓
Cleaning of Filters/Strainers				♦				CBRE	✓
Flushing of Little Used Outlets		♦						CBRE	✓
Calorifier Temperature Check		♦						CBRE	✓
Flushing outlets on site as per schedule		♦						CBRE	✓
Flush Deadlegs		♦						CBRE	✓
Blowdown of Calorifier Drains				♦				CBRE	✓
Check Chlorine Dioxide is Operational	♦							CBRE	✓
ZIP Boiler and POU Temp Checks				♦				CBRE	✓
6 Monthly Clean and descale of all				♦				CBRE	✓
CWST temp checks		♦						CBRE	✓