



CORROSION & ENVIRONMENTAL SERVICES LTD.

## **Legionella Risk Assessments in Hot and Cold Water Systems**

Dr. P. Munn, C.Eng., MIM, MICorr, MWMSoc.

### **Legionella Bacteria and Legionnaire's Disease**

Legionnaire's disease was first identified following a large outbreak of pneumonia amongst delegates to an American Legion Convention in Philadelphia in 1976, which led to several fatalities. The bacteria responsible for legionnaire's disease are common and are found in low numbers naturally in rivers, lakes and reservoirs. However, they can multiply in manmade water systems, such as cooling towers, hot and cold water systems and spas, where conditions may be favourable for growth. When water droplets or aerosols, containing high numbers of bacteria, are inhaled by a susceptible person, legionnaire's disease may develop.

Legionella bacteria are responsible not only for legionnaire's disease but also for Pontiac fever and Lochgoilhead fever. However, whereas, Pontiac fever and Lochgoilhead fever are non-pneumatic forms and have not resulted in any deaths, legionnaire's disease is fatal in about 12% of cases (up to 33% in hospitals). In the UK, there are 200-250 reported cases each year but the true figure is almost certainly much higher, since many cases are not properly identified. The symptoms include high fever, chills, headaches, cough, breathlessness, diarrhoea, vomiting and delirium, although these symptoms do not always appear.

For legionella bacteria to multiply, they need the correct temperature, a source of nutrients and a period of stagnation. They can grow at temperatures between 20 and 45°C with the maximum growth rate being 37°C. They do not survive at temperatures >60°C. Sources of nutrients include algae, amoebae and other bacteria. However, the presence of sediment, sludge, corrosion products and scale together with biofilms play an important role in harbouring and providing favourable conditions in which legionella bacteria may grow. These deposits can protect legionella bacteria from temperatures and concentrations of biocide that would otherwise kill the organisms if they were freely suspended in the water.

### **Legislation and Health and Safety Law**

Duties under the Health and Safety at Work Act 1974 extend to risks from legionella bacteria, which may arise from work activities. Following on from this, the Management H&S at Work Regulations 1999 provide a broad framework for controlling health and safety at work. Not only does this require risk assessments to be carried out by employers

but it also requires that competent help is used in applying the provisions of the health and safety law and that procedures are put in place for dealing with any serious danger.

Under the COSHH Regulations 2002, owners of premises are responsible for controlling exposure of employees, themselves, visitors and people in the vicinity to substances likely to cause harm. Risk assessments must be carried out by a competent person and these must be written down, if there are more than 5 employees. Measures to prevent exposure, or if this is not possible, control exposure of the hazardous agent must be put in place. These control measures must be regularly maintained, checked and tested. In addition, provision of information and training for employees must be provided.

### **The Approved Code of Practice, L8**

Specifically for control of legionella, the employer or owner of the premises has to show that they have followed the Approved Code of Practice 2000, known as L8. This document produced by the HSE applies to all premises and businesses, where water is used or stored and where there is a means of creating and transmitting water droplets which may be inhaled thereby creating a reasonable foreseeable risk of exposure to legionella bacteria.

Such a risk exists in water systems incorporating a cooling tower or evaporative condenser; hot and cold water systems and other systems containing water above 20°C, which may release a spray or aerosol. However, in domestic houses, the risk of legionella growing in the hot and cold water systems sufficient to cause legionella is considered very slight and therefore risk assessments are not usually required here. However, in larger buildings, such as hotels, offices, schools and hospitals, water systems are much larger and more complex and therefore risk assessments should be carried out. The water system includes plant and equipment associated with the system e.g. all associated pipework, pumps, storage tanks, calorifiers, valves etc. Showers, baths, sinks and jacuzzi's are all places where aerosols or fine water sprays may be produced.

Risk assessment carried out by a competent person involves identification and evaluation of potential sources of risk and include means to prevent or control exposure. Where the risk assessment shows that the risks are insignificant and unlikely to increase, no further measures are required. However, risk assessments need to be reviewed regularly, in particular when the original risk assessment is considered to be no longer valid (e.g. if the system has been extended or modified). The risk assessment together with all records enables the Statutory Duty Holder to show that all pertinent factors and steps to control the risk of legionella have been considered.

A risk assessment will need to be reviewed if there are changes in the water system or its use; changes in the use of the building; new information on risks and control measures; when control measures are no longer effective and when a case of legionnaire's disease or legionellosis is associated with the system.

## **The Risk Assessment Process**

On commencing a risk assessment, the scope of the assessment needs first to be established and a description of the site and water systems, including relevant aspects of design, operation, control and maintenance need to be provided. Full system drawings or a schematic detailed enough to understand the system fully should be provided. An asset register of all associated components is then made. The water system is inspected to check the condition and confirm aspects of its design, operation and maintenance, including any details of water treatment, cleaning and chlorination or other legionella control regimes.

The risk assessment process outlined in L8 involves first identifying the hazards in the system and allocating these a hazard rating. The risks are then assessed and given a risk rating, taking into account the effectiveness of any controls. Actual site practices, as well as non-routine operations must be considered. For legionella the risk factors include the presence of legionella bacteria; conditions suitable for multiplication e.g. a suitable temperature (20-45°C) and a source of nutrients (from supply water or atmosphere); outlets where aerosols or fine sprays can be produced and the presence and numbers of people who may be exposed, especially where people are particularly vulnerable, e.g. healthcare.

Only then can the measures to control the risk be identified. Recommendations for incorporating these in a written control scheme, including any remedial actions and the requirements for training and records can then be made.

The risk control measures, which may be required include avoidance of temperatures and conditions favourable to growth of legionella (e.g. lagging pipes); control of the release of water spray; avoidance of water stagnation; removal of materials likely to harbour bacteria or provide nutrients for growth; instigating regular cleaning of tanks; ensuring correct operation and maintenance of water system to prevent supply water within premises and use of water treatment techniques (where appropriate).

After a risk assessment is carried out and a report is produced, it is the responsibility of the owner or employer to implement and manage the precautions raised in the risk assessment and to keep proper records. These may be weekly actions (e.g. flushing through little-used outlets); monthly actions (e.g. checking temperatures at flow and return to calorifiers and at sentinel taps) or annual checks (e.g. for legionella analysis of water samples).

## **Reference**

*The Control of Legionella Bacteria in Water Systems: Approved Code of Practice and Guidance*; HSE 2000; ISBN 0 7176 1772 6