

About Legionnaire's Disease

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, immuno-suppression, 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. The collective term used to cover the group of diseases caused by legionella bacteria is 'legionellosis'.

Areas of Risk in building design and plant & equipment specification

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, and
- (d) other plant and systems containing water which 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 or when being maintained. (*Other systems include humidifiers, air washers, spa baths and pools, car & commercial vehicle washes, wet scrubbers, indoor fountains and water features, etc.*)

Natural history of the legionella bacterium

Legionella bacteria are common and can be found naturally in environmental water sources such as rivers, lakes and reservoirs, usually in low numbers. Legionella bacteria can survive under a wide variety of environmental conditions and have been found in water at temperatures between 6°C and 60°C. Water temperatures in the range 20°C to 45°C seem to favour growth. The organisms do not appear to multiply below 20°C and will not survive above 60°C. They may however remain dormant in cool water and multiply only when water temperatures reach a suitable level.

Legionella bacteria also require a supply of nutrients to multiply. Nutrient sources include:

- commonly encountered organisms within the water system itself such as algae, amoebae and other bacteria.

- The presence of sediment, sludge, scale and other material within the system, together with bio-films*, are also thought to play an important role in harbouring and providing favourable conditions in which the legionella bacteria may grow.

*A bio-film is a thin layer of micro-organisms which may form slime on the surfaces in contact with water. Such biofilms, sludge and scale can protect legionella bacteria from temperatures and concentrations of biocide that would otherwise kill or inhibit these organisms if they were freely suspended in the water.

As legionella bacteria are commonly encountered in the natural environment they may eventually colonise manufactured water systems and be found in cooling tower systems, hot and cold water systems and other plant which uses or stores water.

The risk of exposure to legionella bacteria can therefore be effectively managed by introducing measures which:

- (a) do not allow proliferation of the organisms in the water system; **and**
- (b) reduce, so far as is reasonably practicable, exposure to water droplets and aerosol.

Responsibilities of Designers and Specifiers and Suppliers

Those who design, manufacture, or supply water systems that may create a risk of exposure to legionella bacteria have duties under health and safety legislation. They must, so far as is reasonably practicable, ensure that the equipment is designed and constructed (or modified) so that it is safe in use and enables safe and easy operation, cleaning and maintenance. You should therefore:

- (a) ensure that the water system is designed and constructed so that it will be safe and without risks to health when used; **and**
- (b) provide adequate information for the user about the risk and the measures necessary to ensure that the water system(s) will be safe and without risks to health when used. This information should be updated in the light of any new information about significant risks to health and safety that becomes available.

There are a number of **key points** to consider in the design and construction of water systems.

Cooling systems should be designed and constructed so that they:

- (a) Comply with relevant British Standards or their European/International equivalents;

(b) Control the release of drift by fitting effective drift eliminators (such devices do not eliminate but rather reduce drift). Spray from other parts of the system should also be controlled;

(c) Aid safe operation - for example, water circuitry should be as simple as possible, ideally without deadlegs, or if this is not possible, with the length of deadlegs limited;

(d) aid cleaning and disinfection - for example, those parts of the system which need regular cleaning should be easily accessible, readily removable and easily dismantled; and

(e) Be made of materials which can be easily disinfected and which do not support microbial growth.

Hot and cold water systems should be designed and constructed so that they:

(a) comply with The Water (Scotland) Act 1980 other relevant Legislation, Byelaws; and the Water Regulations Advisory Scheme.

The Water Regulations Advisory Scheme (WRAS)

All water system products, materials and fittings used within the boundary of our properties up to the point of discharge must be of an appropriate standard and quality to comply with the WRAS type approval or 'deemed to satisfy' criteria.

Those specifying products or materials should consult the WRAS on-line directory to confirm appropriate approvals. Fife Council recommends a "best practice" approach of including WRAS approval numbers or appropriate BSI Information in Bills of Quantities, schedules etc. and ensuring all products are sourced directly from reputable suppliers.

For more information see: <https://www.wrasapprovals.co.uk/approvals-directory>

(b) aid safe operation - for example, without deadlegs, or if this is not possible, with the length of deadlegs limited (cap any terminations **as close as possible** to the supply) and non-essential standby plant disconnected or removed;

(c) reduce stored cold water to a minimum needed to meet peak needs;

(d) aid cleaning and disinfection - for example, by providing suitable access points within the system;

(e) minimise heat gain/loss - for example, water pipes and storage tanks should be insulated, and hot and cold pipes should not be in close proximity in the same duct or enclosure;

(f) are provided with appropriate information to ensure correct installation, commissioning and maintenance of the system(s).

Manufacturers and suppliers of water systems (including plant which incorporates water systems, e.g. vehicle washes) should provide adequate information and instructions on their safe use. This should include information about those aspects of operation and maintenance which have a bearing on the risk of legionella proliferation.

Use of Rain Water (RWH) and Grey Water systems

Particular care is required in the design of grey-water recovery and rain water harvesting (RWH) systems. Storage, system capacity and use issues become critical, and for grey-water schemes in particular (the re-use of water from baths, basins and showers) the disinfection or biological treatment systems and ongoing maintenance issues can have a significant impact on life cycle costs, even where Government sponsored “pay-back” schemes are in operation.

Grey-water is usually used in buildings only for flushing of WCs, where aerosol issues do not arise. Grey-water recycling is particularly attractive for commercial vehicle washes, where the quality of recovered water is high.

With these types of systems, reduced demand for potable water may be offset by increased energy and other ongoing costs.

See also sources of further information below.

References and sources of further information

1. *Minimising the risk of Legionnaire's Disease TM13 The Chartered Institute of Building Services Engineers ISBN 1 903287 02 2*
2. CIRIA best practice guidance C539 “Rainwater and grey water use in buildings”
3. CIBSE ‘Knowledge Series’ “Reclaimed Water” (2005)
4. Model Agreement for Sustainable Water Management Systems (CIRIA 2004 document)
5. The Water Regulations Advisory Scheme, See: www.wras.co.uk
6. See <http://www.hse.gov.uk/legionnaires> for latest Health and Safety Executive publications

(references current at March 2011)

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