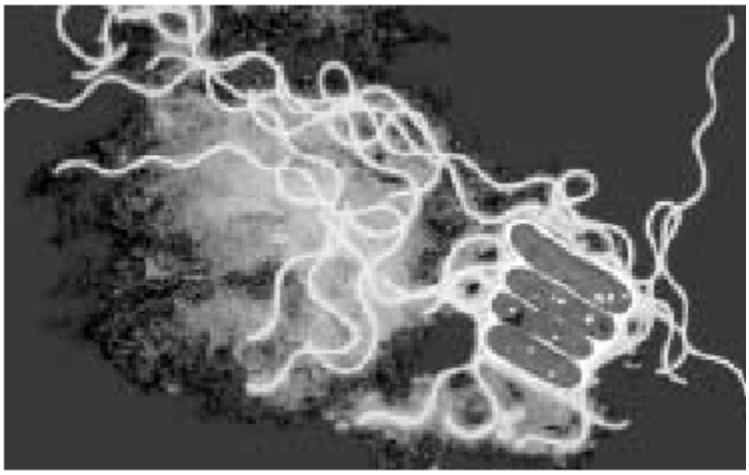
“Legionnaires’ Disease:

The Control of Legionella Bacteria in Water Systems”

A Précis of L8 by Legionella Control International



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Published by the Health & Safety Commission

L8 is underwritten by:

- Health & Safety at Work Act
- Control of Substances Hazardous to Health (COSHH) Regulations
- Management of Health & Safety at Work Regulations

Systems at risk:

- Any plant containing water likely to exceed 20^{o}C and which may release an aerosol or spray
- Cooling Towers / Evaporative Condensers
- Hot & Cold Water Systems

Part 1: Approved Code of Practice

Identify the Risk: *Risk Assessment*

- Is there a reasonably foreseeable potential for harm to health from exposure to Legionella-containing aerosols?
- What measures are required to prevent, or adequately control, the risk?
  - Are Legionella bacteria present?
  - Are conditions suitable for growth of Legionella? (Temperature of 20-45^{o}C? Source of nutrients?)
  - Can an aerosol be generated?
  - Can people be exposed to the aerosol?
- Review the Risk Assessment regularly (at least every two years).

Manage the Risk: *Management Responsibilities / Training / Competence*

- A person must be appointed to take managerial responsibility and to provide supervision for the implementation of the control measures
- Persons carrying out the Risk Assessment, and drawing up and implementing the Control Measures, must be competent to do so
- Staff responsibilities and lines of communication must be properly defined and clearly documented

Preventing or Controlling the Risk : *Implementing Control Measures*

There must be a Written Scheme for controlling the risk from exposure.

The Scheme should include:

- Up-to-date schematic of the plant
- Description of the correct and safe operation of the plant
- The precautions to be taken
- Checks to ensure the efficacy of the Scheme
- Remedial action to be taken if the Scheme is shown to be ineffective

Typical precautions include:

- Controlling the generation and dissemination of aerosols
- Avoiding water temperature and conditions favourable for Legionella
- Avoiding water stagnation
- Avoiding system materials which support microbial growth
- Maintaining the cleanliness of the system and the water in it
- Using appropriate water treatment

Monitoring and routine inspection of the system should include:

- Checking the condition and performance of the plant
- Inspecting accessible parts of the system for damage and signs of contamination
- Monitoring to ensure the treatment regime continues to control to the required standard

Record Keeping

Good record keeping is a vital part of the Legionella control process. The responsible person must ensure that adequate records are kept which detail:

- The person(s) responsible for conducting the Risk Assessment and managing the Written Scheme
- The significant findings of the Risk Assessment
- The Written Scheme, and details of its implementation
- The results and dates of inspections, monitoring, tests and checks

Part 2: Guidance on Controlling the Risk from Exposure to Legionella Bacteria

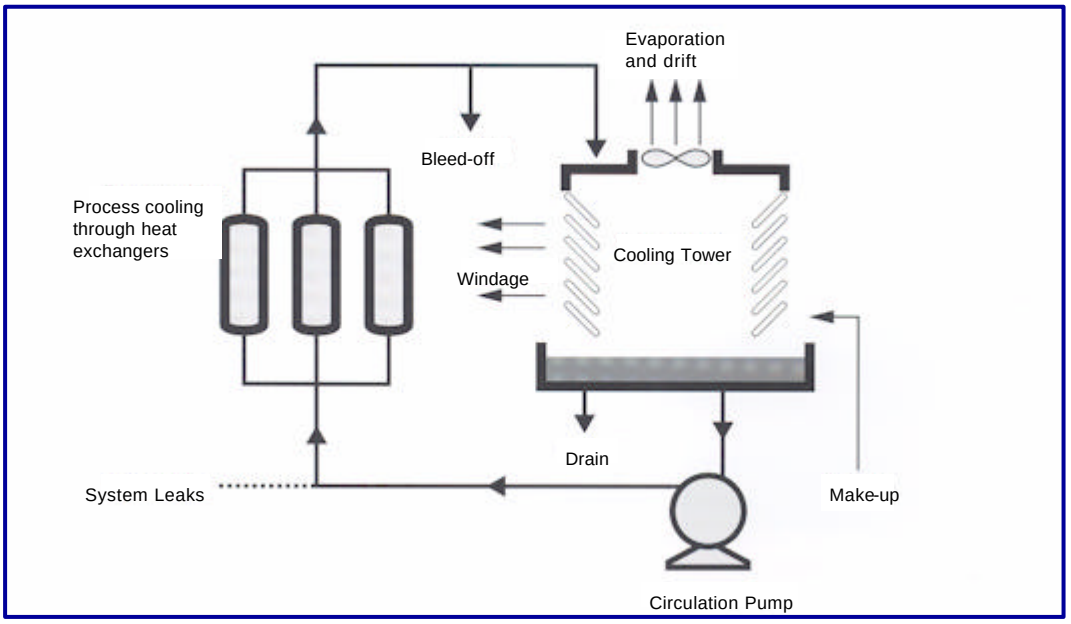
Cooling Systems (incorporating cooling towers or evaporative condensers)

These systems must be registered with the Local Authority under the Notification of Cooling Towers and Evaporative Condensers Regulations 1999 (Statutory Instrument 2225).

Cooling Systems must be:

- Properly commissioned to ensure that they operate correctly
- Kept in regular use wherever possible
- Kept filled with biocide- and inhibitor-treated water if out of use for longer than a month
- Properly maintained according to a comprehensive schedule

Figure 1. Typical Industrial Cooling System



Treatment programmes for Cooling Systems must encompass control of:

- Microbiological activity - by using biocides
- Corrosion - by using anodic and cathodic inhibitors
- Scaling - by using preventatives or pre-treatment
- Fouling - by using dispersants or side-stream filtration

None of these four processes can be neglected - each impacts upon the other.

Monitoring of Cooling Systems should encompass routine tests of:

- The composition of the make-up and system water
- The reserves of water treatment chemicals
- Microbiological tests (general fouling and Legionella bacteria)

Microbiological monitoring action levels for Cooling Systems are:

General fouling bacteria (per mL)	Legionella (per L)	Action required
10,000 or less	100 or less	System under control
>10,000 but <100,000	>100 but <1000	Review programme operation
>100,000	>1,000	Implement corrective action

Testing for Legionella should be conducted at least quarterly during the year.

Cleaning and disinfection of Cooling Systems should be done at least twice a year, or more frequently if the system is particularly prone to fouling.

This important maintenance activity incorporates pre-cleaning disinfection, manual cleaning and post-cleaning disinfection stages.

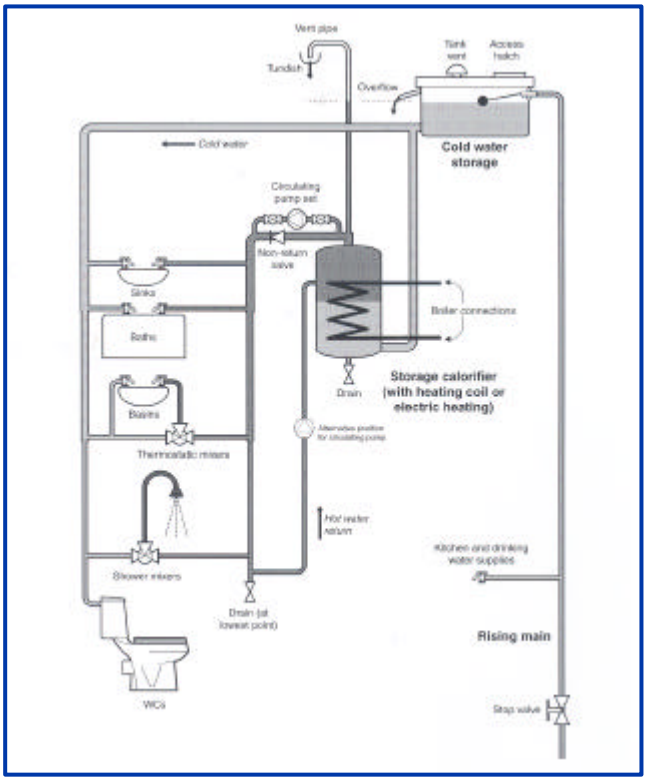
Free chlorine is the disinfectant of choice - L8 details concentrations and contact times - though other oxidizing biocides such as bromine or chlorine dioxide can be used.

Hot & Cold Water Services

Design & Construction considerations should ensure that:

- Systems are not over-sized
- Systems comply with the Water Supply (Water Fittings) Regulations
- Materials which support microbial growth are not used
- Low-corrosion materials are used where possible
- Water tanks are fitted with adequate lids
- Multiple linked tanks are avoided (unequal flow rates)
- Showers which would be used infrequently are not fitted
- Calorifiers are sized to meet fluctuating demands adequately
- Time-controlled shunt pumps are fitted to large calorifiers
- Hot water distribution pipes are insulated
- Trace heating is considered for non-circulatory hot water pipework
- Low use cold outlets are installed upstream of high use outlets
- The volume of cold water stored is minimised

Figure 2 Typical Gravity System with recirculation



Management of hot and cold water services should ensure that:

- New systems are commissioned correctly
- Existing systems are re-commissioned correctly after being out of use
- Water undertakers are warned of excessive incoming mains temperatures
- Temperature stratification in calorifiers is avoided
- Infrequently used outlets are regularly flushed

Treatment and control programmes should ensure that:

- Hot and cold water systems are kept clean
- Suitable temperature regimes are used to control Legionella growth
  - Store hot water at 60^{o}C
  - Hot water not < 50^{o}C at outlets
  - Cold water stored at not >20^{o}C
- Biocides, if used, are dosed under strictly controlled conditions (chlorine dioxide or ionisation can be used as on-line biocides)

Monitoring of hot and cold water services should include:

- Checks for temperature, water demand and cleanliness
- Details of who carried out the checks and when
- Schematics of the hot and cold water systems
- Careful record keeping
- Annual checks of systems and maintenance schedules

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Testing hot and cold water systems for the presence of general fouling bacteria is unnecessary because the water supplied is of potable quality.

Legionella testing of these systems should be carried out when:

- Temperatures are reduced because biocides are in use
- Temperature or biocide regimes are shown to be inadequate
- Legionellosis is suspected or has been identified
- 'At risk' communities are involved, e.g. hospital wards

Cleaning and disinfection of hot and cold water services should be carried out:

- When routine inspection shows it to be necessary
- When the system has been substantially altered
- Following a suspected or actual case of Legionellosis

Disinfection of hot systems involves either:

- Thermal disinfection
  Raise the temperature of the water in the calorifier to at least 60^{o}C and circulate it through the system for not less than 1 hour

- Chemical disinfection
  Chlorinate the water in the cold storage tank to 20 - 50 mg/L free residual chlorine, then allow it to flow to all parts of the system for several hours

Other Risk Systems

There are other types of system which may harbour Legionella bacteria and disseminate them in the form of aerosols, for example, spa & whirlpool baths and humidifiers.

The general principles of Legionella control as applied to cooling systems and hot & cold water services are also relevant to these other risk systems. A Risk Assessment of these systems will reveal the potential to harm health and indicate the control measures which should be implemented.

For spa and whirlpool baths, careful attention to design, maintenance and cleaning is essential. Regular water treatment (disinfection) is required to prevent or control the risk from Legionella.

Atomising humidifiers can become heavily contaminated. Unless they can be regularly and rigorously cleaned and disinfected, it may be more prudent to replace them with humidifiers which do not create a spray, i.e. steam humidifiers.

L8 lists a number of other risk systems, along with the control measures used to prevent or control the growth of Legionella in them.

Further Information

You can obtain copies of the L8 document ‘Legionnaires’ disease. The Control of Legionella Bacteria in Water Systems. Approved Code of Practice & Guidance’ from:

HSE Books
PO Box 1999
Sudbury
Suffolk CO10 2WA
Tel. 01787 881 165
Fax. 01787 313 995

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Contacting Legionella Control International

For more information on all aspects of Legionella control, please contact:

John Dobson
Legionella Control International
Statham House
Talbot Road
Manchester M32 0FP
United Kingdom

Tel: +44 (0) 161 877 0586
Fax: +44 (0) 870 421 5691
E-mail: info@legionellacontrol.com