

## Cooling Towers Information for owners and maintenance personnel

### What is Legionnaires disease?

Legionnaires' disease is a form of pneumonia caused by one of the several species of *Legionella* bacteria. Infection with *Legionella pneumophila* is usually associated with air conditioning cooling towers, while *Legionella longbeachae* is usually associated with potting mix. It is caused by inhaling the Legionella bacteria, and as such isn't contagious.

Symptoms of the disease can include

1. High fever
2. Non-productive cough
3. Chills
4. Headaches
5. Muscle pain
6. Mental confusion
7. Diarrhoea
8. Abdominal pain
9. If conditions get worse death can also result.

### Susceptibility:

People who are most susceptible to Legionnaire's disease are the following groups:

1. The elderly
2. People with existing underlying health conditions, such as the Immuno-suppressed;
3. Heavy smokers;
4. Excessive alcohol consumers;

## **What is a Cooling Tower?**

According to the *Public Health Act 1991* a water cooling system is a device for lowering the temperature of water or other liquid by evaporative cooling or an evaporative condenser which incorporates a circuit containing a refrigerant (NSW COP 2004). This also includes any associated equipment and pipework of the system. In other words a cooling tower cools the water for air conditioning systems or other devices such as refrigerators, by extracting heat from the water stream inside the tower and discharging the waste heat in to the atmosphere. A diagram of a water cooling system has been attached as "Diagram A".

## **Why is it important to maintain cooling towers?**

It is very important to maintain water cooling systems because the warm and damp environment provides favorable conditions for *Legionella* bacteria to grow, and the mechanical operation of the system can also easily discharge the bacteria into the atmosphere (via water droplets, as drift).

Biofilms can build up on the inside of system pipework and in particularly any dead legs where water does not circulate and as such these can provide ideal conditions for micro-organisms to proliferate. Dead legs in hot/warm water systems should be discouraged but if they are unavoidable they should be no more than six meters in length.

Corrosion inside the system can also provide a source of nutrition to bacteria. Other factors which need to be managed in order to prevent the proliferation of bacteria include the following:

1. Algae
2. Flavobacteria - type of disease causing bacteria.
3. Protozoa
4. Temperature
5. pH

## Factors to consider in Cooling Tower maintenance

1. The occupational health and safety legislation and AS 1657 and AS 1470 require the owner of the cooling tower to provide safe and easy access to the water cooling system;
2. Providing removable components such as heat exchangers, to facilitate cleaning and reduce maintenance;
3. All wet surfaces in and around the system must be easily accessible for cleaning and maintenance;
4. Installing drift eliminators and splash guards which can prevent water droplets from escaping into the atmosphere from the cooling tower;
5. Preventing the cooling tower from being exposed to natural light will discourage the growth of algae (which is a food source for Legionella bacteria);
6. Constructing the cooling tower with a UV light resistant and/or corrosion resistant material;
7. Installing smooth gel coating on plastic and fibreglass components;
8. Joints should be tight fitting and sealed to prevent drift and algae lodgement;
9. The internal corners of the tower should be rounded and there should be no dead spots in tower basin;
10. There should be adequate drainage to sewer;
11. There should be a rapid drainage and quick fill facility in the tower

(NSW COP 2004; Legionella Control for Health Officers 2008)

## **BUILDING OWNER'S RESPONSIBILITIES**

Under the provisions of ss43- 46 of the *Public Health Act 1991* building owners are responsible for the installation and maintenance of all water cooling systems to ensure compliance with *Australian / New Zealand Standard AS/NZS 3666: Air-handling and water systems of buildings – Microbial control*. This includes such things as regular (monthly disinfection) thorough cleaning, and also undertaking regular bacteriological testing to ensure that levels of Legionella bacteria are not detected at dangerous levels, and ensuring the system is structurally sound.

*"For the purposes of section 46 of the Act, the additional prescribed operating requirements for a water cooling system are that the system must be equipped with a process designed to control microbial growth, and that process:*

*(a) Must be in operation at all times, and*

*(b) Must be certified by a competent person annually as being an effective process of disinfection under the range of operating conditions that could ordinarily be expected, and*

*(c) Must be sufficiently effective so that:*

*(i) No sample taken from the system subjected to a test for total Legionella numbers in accordance with the relevant Australian standard has a level of Legionella of more than 10 colony-forming units per millilitre, or*

*(ii) No sample taken from the system subjected to a test for heterotrophic plate count in accordance with the relevant Australian Standard has a heterotrophic plate count of more than 100,000 colony forming units per millilitre, "(cl 9 Public Health (Microbial Control) Regulation 2000)"*

The owner or occupier of premises where a water cooling/warm water system is installed in respect of which particulars are required to be registered with the City, is guilty of an offence under clause 15 of the *Public Health (Microbial Control) Regulation 2000* if the City is not provided with the particulars (other than those relating to inspections within 1 month after the person becomes the owner or occupier of the premises, or if there is an alteration to particulars previously provided--within 1 month after the alteration.

## **Annual Certificate of Disinfection**

In addition to the registration of water-cooling and warm water systems, the *Regulation* requires that the disinfection process on water cooling systems be certified on an annual basis.

All water cooling systems must be equipped with a process designed to control microbial growth and such process must be certified by a competent person as prescribed in Clauses 9(2) and 9(3) of the *Regulation*, and this certification is to be provided to the City on an annual basis.

The certifier must confirm that the water cooling system is equipped with a process to control microbial growth, and that an appropriate and effective disinfection process is in place.

## Safe Maintenance of Water Cooling Systems

### **What are you required to do under the law?**

According to the Australian standards/NZS 3666.3:2000 under section 2.6 (Operating and maintenance manuals and maintenance records) you as the owner or maintenance personnel of the water cooling system are required to do the following:

#### ***2.6.1 Operating and maintenance manuals***

Keep an up to date operating and maintenance manual of the water cooling system, including details of the plant, equipment, water treatment equipment. These records are to be kept near the water cooling system at all times, and provided for inspection by authorised officers and maintenance personnel as requested.

#### **Operating and maintenance manuals shall include at least the following:**

- (a) Physical details of the plant, equipment and systems and pre-Treatment processes;
- (b) Recommendations on maintenance including water treatment and management;
- (c) Recommended cleaning, disinfection and emergency decontamination procedures;
- (d) Start-up, operating and shutdown procedures;
- (e) Particulars of the maintenance program, including servicing and cleaning schedules.

#### ***2.6.2 Maintenance records.***

Up-to-date maintenance reports and log books shall be provided for all plant, equipment and systems that are the subject of this standard.

Maintenance records shall contain at least the following information:

- (a) Date, item of plant, equipment or system and nature of service performed.
- (b) Details of defects found and rectification procedure undertaken
- (c) The name of the person and company performing the service.

## THE CITY'S ROLE IN LEGIONELLA CONTROL

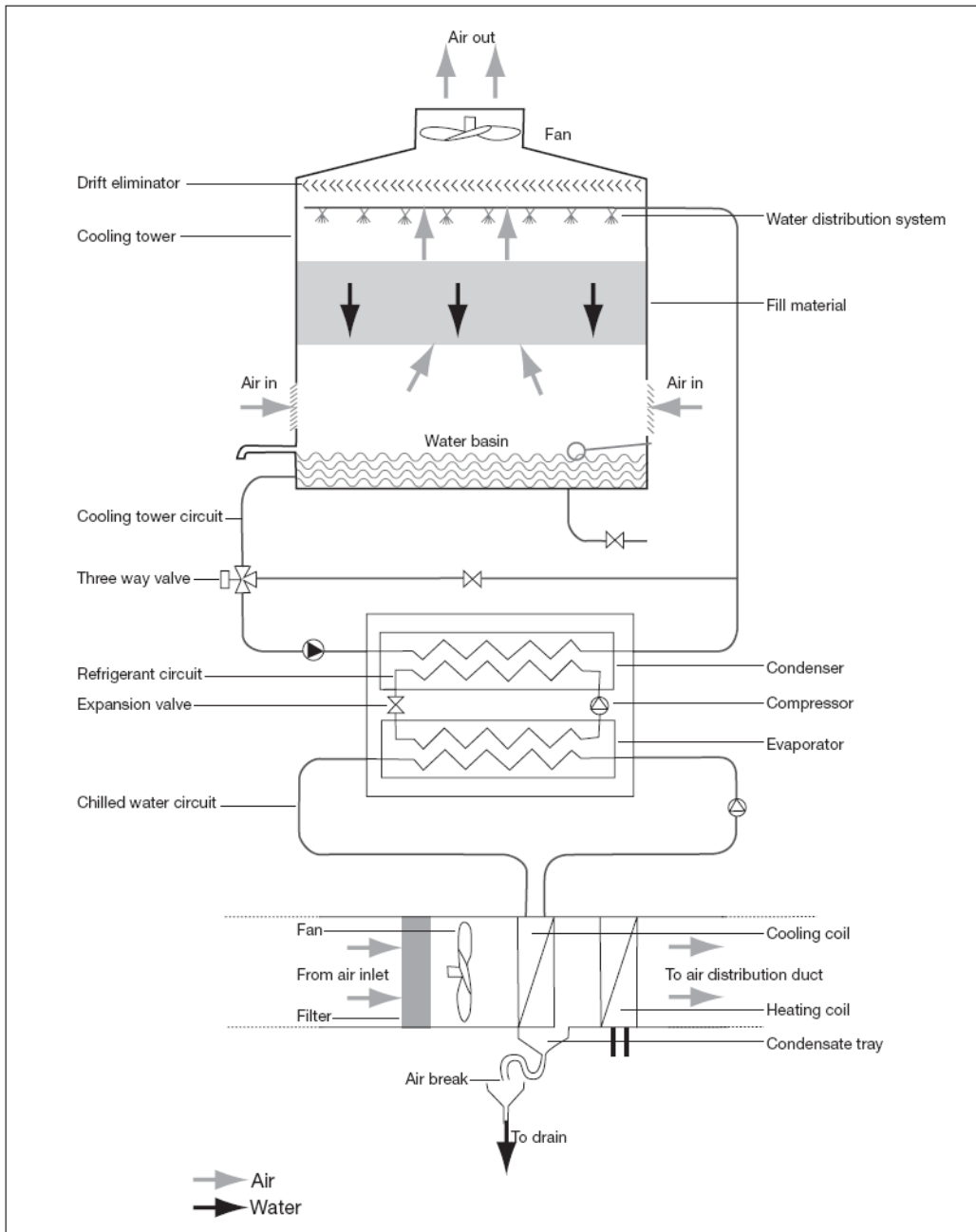
The City maintains a register of all water cooling systems within its local government area. This is set out in CI15 of the *Regulation (Public Health (Microbial Control) Regulation 2000)*

The information that is to be kept on the register includes such things as:

- (a) The type of system;
- (b) The address of the premises at which the system is installed;
- (c) The name, contact details, of the owner of the premises and, if the operation area on the premises is occupied otherwise than by the owner, the particulars of the occupier;
- (e) Details of any inspections carried out by the local authority for the purposes of the Act.

Any outbreak of Legionnaires disease is coordinated by the NSW Health Department under its Legionnaires Disease Emergency Management Plan.

Diagram A: Schematic layout of a water cooling system



(NSW COP 2004)



## References

1. *Australian Standards /NZS 3666.3:2000* , Cl 2.6
2. *Australian Standards/NZ 1657*
3. *Australian Standards/NZ 1470*
4. Legionella Control for Health Officers 2008. NSW, Department of Education and Training 2008
5. (NSW COP 2004) – NSW DEPARTMENT OF HEALTH, 2004. 'NSW Code of Practice for the Control of Legionnaires' Disease, June 2004 2<sup>nd</sup> edition. NSW Department of Health, North Sydney.
6. *Public Health Act 1991 NSW*. Retrieved, July 9 2008 from [www.austlii.edu.au/](http://www.austlii.edu.au/)
7. *Public Health (Microbial Control) Regulation, 2000 NSW*, Cl 9. Retrieved, July 9 2008 from [www.austlii.edu.au/au/legis/nsw/consol\\_act/pha1991126/](http://www.austlii.edu.au/au/legis/nsw/consol_act/pha1991126/)

## Legionella Control - regulatory checklist

### 1. *Public Health (Microbial Control) Regulation 2000:*

- Definitions
- Regulated premises to which this regulation applies.
- Installation requirements of air handling systems, hot and warm water systems and water cooling systems.
- Operating requirements
- Maintenance of above systems

### 2. *Public Health Act 1991 – Part 4 Microbial Control :*

- Purpose of part 4
- Definitions
- Installation of system
- Operation and maintenance of system
- Powers of authorised officers
- Directions to carry out maintenance requirements
- Failure to comply with directions
- Proceedings for offences under part 4

### 3. AS 3666 Part 1 :

- Water cooling systems (AS3666.1.S4)
- General (water cooling systems) (AS3666.1.S4.Cl4.1)
- Location of cooling towers (AS3666.1.S4.Cl 4.3)
- Drift Control (AS3666.1.S4 Cl4.4)
- Control of solids (As3666.1.S4.Cl 4.5)
- Sunlight (As3666.1.S4.Cl 4.6)
- Commissioning of cooling water systems (AS3666.1.S4.Cl 4.7)

The Australian standards can be obtained from the following site:

<http://www.standards.org.au/>